

THIRTY-FIRST ANNUAL REPORT
OF THE
ENTOMOLOGICAL SOCIETY
OF
ONTARIO
1900.

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE.)

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO.



TORONTO:
PRINTED AND PUBLISHED BY L. K. CAMERON.
Printer to the King's Most Excellent Majesty.
1901.

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WARWICK BROS & RUTTER, PRINTERS.
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1900.

To the Honorable John Dryden, Minister of Agriculture :

SIR,—I have the honor to present herewith the thirty-first annual report of the Entomological Society of Ontario.

The thirty-seventh annual meeting of the Society was held in the City of London on the 13th and two following days of November, 1900, when the officers for the ensuing year were elected and the necessary business of the Society was transacted. The report of the proceedings includes the audited financial statement of the Treasurer and reports of the various branches, sections and officers of the Society ; also the papers and addresses on various Entomological topics presented during the meetings.

The *Canadian Entomologist*, the Society's monthly magazine, has been regularly issued and is now completing its thirty-second volume. Its circulation in all parts of the world, and its value as a scientific publication have been well maintained.

I have the honor to be, Sir,

Your obedient servant,

CHARLES J. S. BETHUNE,

Editor.

LONDON, ONTARIO.

ENTOMOLOGICAL SOCIETY OF ONTARIO.

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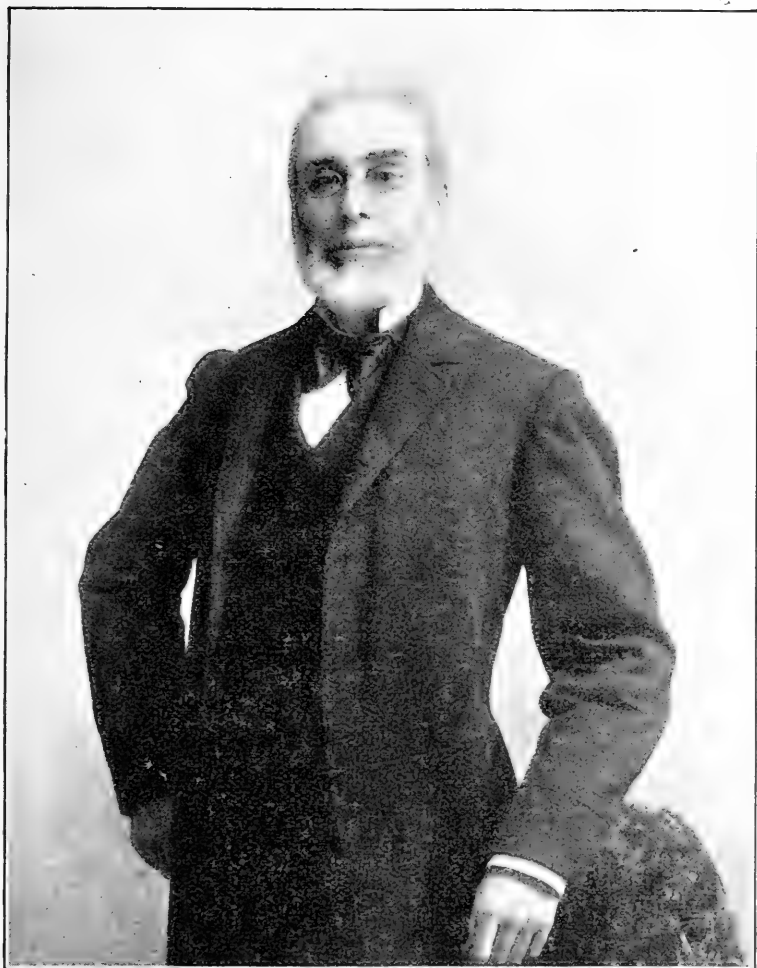
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J. ALSTON MOFFAT, ESQ., LONDON, ONT.
Librarian and Curator of the Entomological Society since 1890.

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THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

ANNUAL MEETING.

The thirty-seventh annual meeting of the Entomological Society of Ontario was held in London, the headquarters of the Society, on the 13th, 14th and 15th of November, 1900.

On Tuesday evening, the 13th, a joint meeting was held with the London Horticultural Society in a lecture room at the Normal School. Notwithstanding the inclemency of the weather, a snowstorm prevailing at the time, the hall was completely filled by a very appreciative audience, representing both Societies and the general public as well. The proceedings were much enlivened by instrumental and vocal musical selections kindly furnished by Miss Morphy and Mrs. Edna S. Robb, who was accompanied by Mr. J. W. Fetherston. The Horticultural Society is a new organization which has not yet completed its first year of existence, but has shewn itself to be full of energy and enterprise. Two very successful flower shows were held during the summer and several public meetings at which addresses were given on horticultural and kindred topics. The directors and officers are all members of the Entomological Society and so intimate are the relations between the two that the younger organization may be regarded as a section of the older and larger institution.

The chair was taken by MR. C. C. JAMES, Deputy Minister of Agriculture for Ontario, who delivered the opening address. He began by explaining the intimate relation that exists between horticulture and entomology, showing that we could have few fruits or flowers if there were no insects, and that there could be no insects if there were no vegetation. While many insects are most beneficial to fruits and flowers, other kinds are most destructive. As noxious or beneficial, the insect world has the closest possible connection with the vegetable kingdom. He then spoke of the various aspects of horticulture and referred, in the first place, to the *labor* side. In the sweat of the brow must the soil be cultivated; no good results can be obtained without hard work, but the earth responds most bountifully when well directed labour is bestowed upon it.

The next aspect is the *financial*. Horticulture must be profitable from a pecuniary point of view, otherwise there would not be so many professionally engaged in it. Their evident success and the expensive character of their equipment shows that they are providing for a real want of the community. All over the country there are extensive conservatories for the production of flowers, and here and there large nursery gardens for the supply of fruit trees and ornamental shrubs and plants.

But is there anything *intellectual* in horticulture? In the early days of this country the pioneer farmers devoted themselves exclusively to the raising of grain, and they began in the same way in Manitoba. All that they produced in excess of their own requirements was bartered for the necessary supplies of their families. After a time the care of cattle and pigs was added to the work of the farm and by degrees, after the lapse of many years, this department grew into the great live stock industry that we find to be so prosperous and so important to-day. The next development was the planting out of a few acres of apple trees and the addition in this way of an orchard to nearly every farm. The benefits derived from this improvement, both in the supply of a most wholesome and agreeable variety for the domestic table and the production of a lucrative crop, were soon realized; more and more land was given up to fruit culture, a higher taste was developed, a more lofty plane of life was reached. The monotonous routine of the early farmer's life was changed to one filled with variety as the seasons came and went, and men found that reading and knowledge were required for the successful prosecution of their varied pursuits. A further mark of progress was the adornment of the homestead with flowers and shrubs. The ornamentation of the home with these objects of natural beauty and the elevation of taste engendered by them indicated the highest stage of country life. The combination of all these things that have been referred to provides a

mode of life that cannot be dull and that requires a high degree of intelligence and ability for its successful prosecution.

Intellectual people, the speaker continued, are much inclined towards horticulture. When such retire with a competence from the business of life they usually find some place on the outskirts of a city or town where there is room for a garden, and there they enjoy their leisure in the cultivation of fruits and flowers. In proof of this devotion to gardening on the part of men who possessed the highest intellectual gifts, the speaker referred to several well-known authors. Blackmore, whose novels hold a place in the first rank, thought more of his fruits and flowers than he did of his books. Rider Haggard not long ago retired to an estate in England, and now he prefers to be spoken of as a farmer or gardener rather than as a writer of fiction. John Burroughs, the charming American writer, shows in his works his devotion to birds and flowers. Charles Dudley Warner lived for ten years in Hartford before he became popular, and then it was due to his papers as an amateur gardener published in the *Hartford Courier*. These attracted much attention and were published in book-form, with an introduction by Henry Ward Beecher, under the now well-known title "My Summer in a Garden."

The greatest Canadian historian is undoubtedly Francis Parkman. Though not a dweller in our country, he devoted himself to the study of its early annals and produced a series of works that cannot be too highly praised for the beauty of their style and the intense interest of their contents. His recently published biography deserves to be widely read ; it shows that the great moral of his life was the surmounting of difficulties. Almost blind, crippled with rheumatism, prostrated with nervousness, without a really well day for twenty-five years, he yet managed to accomplish a vast amount of admirable literary work. At the early age of twenty-six he made an expedition along the famous "Oregon Trail" in the search for materials for a contemplated book. The hardships he then endured undermined his health and he was compelled to lay aside his literary work for a time. Horticulture became his exclusive pursuit for several years and by its aid he gradually regained his former health and vigour. He made the growing of roses and lilies his specialty, and at one time possessed a thousand varieties of roses and a great number of hybrids that he had obtained from lilies and other flowers. The meritorious character of his work was attested by his winning no less than 326 awards at the flower shows of the Massachusetts Horticultural Society. In 1871 he was actually appointed Professor of Horticulture by Harvard University and he held the position for a year. After that he returned to his literary pursuits and gained a reputation second to none as a painstaking, accurate historian of the romantic period of the early French regime in Canada.

Horticulture when broadly pursued is an education in itself ; it requires undoubted powers of observation and induction, and as it demands intelligence, men of intelligence take a delight in it. It has also a moral aspect. Take the case of a boy—if he has a fondness for flowers and fruits, insects and birds, he cannot be an immoral person. His tastes are too high for that ; his love for the beautiful things in nature raises him to a higher level and exalts his aspirations far above the sordid things of earth. Believing this to be the result, we can realize how important it is that space should be given in our School system for "Nature Study." It instinctively appeals to the hearts of all children, and by its cultivation leads them on to higher things and makes them better fitted to take their place with their fellows in later life—to do their duty more intelligently, more uprightly, towards their country, their neighbours, and at their own fireside.

THE PLANTING, CARE AND PRUNING OF THE TREES IN THE PARKS AND STREETS OF THE CITY.

BY MR. W. E. SAUNDERS, OF LONDON.

The subject upon which I have to speak to you to-night is of great importance from every point of view, and while I only intend to touch upon certain phases, I feel sure the interest you have in the matter will lead you to follow it out in other lines also.

In nature, trees grow in one of two ways—either in a crowded forest, or in places more or less open, where they get plenty of light. Although light is free to all, yet

among the trees it is the only necessary for which they enter a great competitive struggle, upon which their very lives depend. When once started a tree cannot help getting a certain quantity of food and moisture, but unless it receives light also, it dies.

In the forest, trees grow as closely together as they can live, and there is a constant struggle to reach the top; those that succeed in doing so will spread out, and by shading the lower ones, kill them just as surely as though one cut them off with an axe. This method of growth shades the ground closely, keeping it damp and cool, and each year's crop of leaves buries beneath it as it falls the dead limbs and bark chips which fell during the summer and preceding winter, and these, kept always damp by this mulch of leaves, soon decay, and with the leaves themselves form what we know as leaf-mould, the whole process being nature's method of making fertile soil. This is the normal forest condition, and the product of its development is timber, straight-grained, strong and nearly knot-free wood, the joy of the carpenter's heart and one of the best gifts of the Creator to man.

But once in a while, in natural conditions, and more often when the agency of man is involved, a tree gets a chance to grow in a place where there is an abundance of light on all sides, and what result do we find? This tree, instead of growing tall as rapidly as possible, for fear that some competitor will cut off its supply of light, grows broad nearly as fast as it grows tall, and sometimes faster; all sides are covered with leaves, and all the branches beneath are draped with leaves in nature's own unequaled manner. Between these two styles of trees there is little resemblance; the shape is different, the leaves are all over, instead of merely at the top, while the wood, though equally good for burning, is so full of knots from the well developed limbs that it is nearly useless for lumber, but for beauty there is no comparison. The one shows nature in a creative mood making soil and timber for the use of generations yet unborn; and the other shows her in an artistic mood, and the product is something whose beauty is rarely, if ever, equaled by the artifice of man.

Scarcely can the dullest-minded person pass a beautiful tree without rendering his meed of admiration, and many of these growths are of such surpassing beauty that one is tempted to wonder if the Creator could possibly make anything finer, and yet so inscrutable are the ways of some men that they cut, maul, disfigure and distort these gifts of God, and they appear to think that He does not know how a tree should grow and that it is their duty to teach Him.

In our parks and city streets trees are grown mainly for purposes of shade and beauty, and as the coolest and most dense shade is given by the most beautiful trees, namely, those that are covered with leaves above, below and on all sides, it naturally follows that our city trees should be grown in this form. And there is but one way to grow them after this manner, and that is by giving them plenty of light, and keeping the trimming fiend at a distance.

In Victoria Park, young as it is, many trees are at this moment ugly and deformed by a want of observance of these conditions, light and trimming, and, in fact, one can see there some of the most striking examples of how not to grow a tree that can be found in a long journey. But it seems invidious to single out Victoria Park, when one can see in any part of the city glaring examples of distrust in the Creator's good taste and ability to grow a tree properly.

To many people who do their own pruning and do a good deal of it, the idea may not have occurred that nature really intended certain trees to grow in certain forms, and that no matter how they may be pruned, that form will always be the ultimate aim of the tree. They fail also to realize that the hand of God is omnipotent, and that their best endeavours will only mar the perfection of beauty into which a tree would come if permitted to follow its natural bent.

The love of trees is implanted deep in the nature of nearly every person. Many people do not realize this until they come into possession of a plot of ground, where a few trees are growing, when their natural affection comes quickly to the surface. But few, however, have this feeling so chastened with wisdom as to enable them to treat their trees well; nearly all want to grow two, three or even a dozen trees in the space that should be given to one, not realizing how much better it would be to have one fine, large, well-shaped, handsome tree, than to have half a dozen stunted, mis-shapen, lopsided ones, whose only real utility is for consumption as fuel. No better proof of this deeply im-

planted love can be offered than the fact that it is almost impossible to persuade the average man to part with a single one of his trees, even when the destruction of one means the betterment of the others.

Occasionally, however, one sees a tree, even in London, that has had unlimited chance to develop, and the owners of these grand trees declare them to be without price; but these beautiful examples are all too few. The other extreme is everywhere, and perhaps the most flagrant case in London is in front of the Collegiate Institute. There stand three or four rows of trees, not one of which is now, or has any prospect of ever being anything but an eyesore, and yet those trees are old enough and have used enough nourishment from the soil and light from above to have made trees as handsome as any in the city had they been given proper opportunity. They are now so far gone that it would be almost impossible to make a really fine tree out of a single one of them; and what has occurred here is in process of occurring all over where from two to ten trees are planted in the space which one large, well-grown tree will need in twenty-five years.

At irregular intervals a man, called by courtesy a "tree-pruner," more or less authorized by those who rule over us to butcher every inanimate object, travels through our streets and makes a bad matter still worse.

A gentleman living near my house had last summer a very handsome cut-leaved birch and a good many maples growing on his front lawn. Noticing that the birch was beginning to suffer from being overcrowded, I one day complimented him on the beauty of his tree, and suggested that it needed more room in order to retain its beauty. He replied that it was a very nice tree, but it needed pruning, and he was getting a man who understood such things to come and see to it. The beauty of this species of birch lies in the long, slender, drooping branchlets, and in the handsome pyramidal shape of the tree; but this "pruner" sawed off the trunk of this tree at about eight feet from the top, sawed one-third off the larger limbs, and left the tree shorn of all its beauty and with the work of years destroyed. All the tree needed was to receive plenty of light and to be left alone. Such examples are abundant.

I notice lately that the tree pruner is getting in his deadly work at Springbank also. Within the past year or two the birches, poplars, maples, etc., near the pump-house have had from two to five feet taken off most of their branches, and from the trunk also. The object of this treatment is undiscoverable. The spruces, too, in other parts of the grounds, are receiving similar attention, and of all trees the spruce needs pruning least, and bears it worst. A pruned spruce is no longer a spruce, but an abortion, unlike anything in nature and is fit only for the brush pile, for it will never be itself again.

When trees are too many, cut some of them down. A tree which is too large for its environment can never be made handsome by any system of pruning, and not only that, it will spoil others which might be ornamental if its space were vacant.

Now, a word as to the planting of shade trees. In London we suffer from a superfluity of silver maple (*Acer dasycarpum*). This is a quick growing tree of handsome form, but there are others that are as quick growing and many that, though slow growers, are more desirable and very handsome. Our streets should not all be planted with one kind of tree. Monotony should be avoided. Besides, when a blighting disease or a devastating insect, affecting possibly only one species of tree, reaches a city planted with that tree only, that place is liable to have very few good trees left. Some twenty-five years ago the streets of London had many locust trees, whose foliage and flowers are both beautiful, but the locust borer came among them and now they are gone. The maple is a grand tree, hardy and nobly beautiful, but we have many other fine trees also, and doubtless it was never intended that we should confine ourselves to the use of one species only. The birches, three or four species of beautiful trees, immortalized in poetry and characteristic of the north; the lofty elm, whose fame as a street tree in New England has spread over the entire continent; the fragrant basswood, the evergreen spruces and cedar, the hemlock, which I sometimes think is the handsomest of all our trees, and the nut trees, chestnut, butternut, walnut, beech and the hickories—all these and many more have beauties of their own, and should be largely used, particularly the nut class, which render the parks attractive to the squirrels and the birds and the children, and is it not for the children, particularly those of the poorer people, for whose use the parks should mainly exist? I have no patience with the park regulations which say to the children, "Keep off the Grass." Rather

let them say, "Boys and girls, this park is for you; don't destroy it, but enjoy it in every possible way." Some day I hope we shall see this principle recognized.

Beauty in the streets and parks is an asset, and should be well looked after, as it is perhaps the greatest attraction a city can have, next to a low tax rate; and although we have to-day many thousands of spoiled, ugly trees, fit only for the woodpile, yet there are thousands more growing up, and intelligent care can prevent most of them from following the example set by their elders.

These points upon which I have touched affect not only our own city, but almost every city and town in our country; and the need for intelligent care is urgent.

It was only a few weeks ago that an eminent horticulturist wrote in the pages of *Gardening*, a leading American magazine, of the folly of planting trees in rows along the drives in parks, a method which is the worst possible, for besides spoiling the artistic appearance of the place, it prevents the people on the drives from the realization and the enjoyment of the beauties of either the nearby or the distant view, and yet, despite of the fact that this principle is freely stated and admitted by the best authorities, it is the very method which is being adopted in our river park, now in process of formation; and not only that, but the chief part of the trees planted have been soft maples and Norway spruces, the very ones of which Londoners have already far too many. It is to be hoped that ere long different methods may prevail, and while there is yet time the best may be made of the material now planted, and that the future may be properly provided for by the planting of such trees as will lend variety and beauty to the landscape. How this is to be accomplished is not difficult to tell, for it can only be done by placing the control of such matters in the hands of men who have given thought and study to the subject. Were our own city council, for instance, to appoint for 1901 a committee consisting of a few such men, and to give them a free hand in the matter the effect on the appearance of our city parks and streets would be great and lasting.

I have not touched upon the matter of shrubs and flowering plants, but it would be easy to make a great improvement over present conditions were the plan above mentioned to come into action, and no plan would be complete that did not aim at the best results in these points, as well as others; but a shrub may be at its best in five or ten years, whereas a tree is the growth of decades, and neglect for ten years may ruin the result of twenty-five years' careful work and thought.

Dr. JAMES FLETCHER, Dominion Entomologist and Botanist, Experimental Farms, Ottawa, was the next speaker. His address was illustrated with beautiful lantern pictures, which gave great pleasure to the audience. The excellent lantern was kindly provided by Mr. Merchant, Principal of the Normal School, who was assisted in its manipulation by Mr. K. W. Rennie.

Dr. Fletcher first presented a series of pictures in illustration of the paper that had just been read by Mr. Saunders and showed how trees should be grown and treated, giving as examples specimens that were growing on the Experimental Farms at Ottawa and in the North-West. Many of these were from photographs taken on the grounds of the Experimental Farm at Ottawa, and had been specially lent for the occasion by Dr. William Saunders, the Director. Among others he exhibited the Black Walnut, Russian Poplar, Austrian Pine, Blue Spruce, Scotch Pine, Cutleaved Birch, and some very remarkable trees in the Rocky Mountains and in British Columbia; he also showed some beautiful flowering shrubs and other interesting plants, the *Hydrangea paniculata grandiflora*, *Spiraea van Houttei*, Mary Arnott Rose, Charles X Lilac, *Cypripedium spectabile*, etc.; the Devil's Club (a most troublesome plant to mountain climbers), Hedges on the North-West Experimental Farms, Dr. Saunders's Hybrids from Apple and *Pyrus baccata*; the method of spraying trees at Ottawa.

He then took up the subject of insects, showing how those that are injurious may be divided into two great classes according to the mode in which they partake of their food, namely the biting (those furnished with jaws) such as caterpillars, grubs, beetles, &c., and the sucking (those provided with a beak or sucker), such as mosquitoes, aphides, bugs, &c. The former can be destroyed by poisoning their food with such substances as Paris green, hellebore, insect-powder, &c., but the latter cannot be reached in this way, and must be subdued by substances that will smother them when applied to their bodies, viz., kerosene emulsion, whale-oil soap, &c. The many beneficial species of insects, such as lady-birds, ichneumons, carnivorous ground beetle, which prey upon cut-worms, and

many others, ought to be familiar to all, so that they should not be wantonly trodden under foot or otherwise destroyed. Excellent figures of all those referred to were shewn upon the screen, and a large number of our most prevalent insect pests, among others, the cabbage-root maggot, the devastating and climbing cut-worms, the May beetle (white grub), pea-weevil and pea-aphis, pear psylla, eye-spotted bud-moth, canker and palmer worms, the cigar case-bearer, plum sphinx and curculio, grape-vine flea beetle, spruce gall-louse, tent caterpillars, codling moth, San José scale, and the lovely Luna moth. Each picture as it appeared was briefly described in the speaker's well-known graphic and often humorous manner, and the interest and attention of the large audience were maintained to the last.

At the close of Dr. Fletcher's address, the following resolution was proposed by Dr. Bethune, who spoke briefly in its support, and seconded by Principal Kirk; on being put to the meeting, it was unanimously adopted:

"That this meeting of the Horticultural and Entomological Societies endorses the idea that the control of the city's horticulture should be in the hands of men who have made this science a study; and that this meeting urges upon the City Council the advisability of placing in the hands of a small committee of citizens the entire control of the shade trees on the streets and in the parks of London, believing that in this way only can the best results be accomplished; and that the secretaries of the two societies are hereby instructed to send copies of this resolution to the Mayor and the City Clerk early in January, 1901, asking that it be brought before the Council at the earliest possible moment, and requesting that action be taken thereon."

At the conclusion, votes of thanks were tendered to the ladies for the musical treat that they had afforded; Professor James and the other speakers for their interesting addresses; Professor Lochhead, for the loan of a number of slides; and Principal Merchant, for the use of the Lecture room and lantern, and the kind assistance that he and Mr. Rennie had afforded.

WEDNESDAY, NOVEMBER 14TH.

The Council of the Entomological Society met at 10.30 a.m., for the transaction of business and the preparation of their report on the proceedings of the past year. The President occupied the chair, and the meeting continued in session till one o'clock.

The Society met at 2.30 p.m. Among those present were the following: Rev. Dr. Fyles, South Quebec, President; Prof. Lochhead, Ontario Agricultural College, Vice-President; Dr. James Fletcher and Mr. Arthur Gibson, Experimental Farm, Ottawa; Mr. Henry H. Lyman, Montreal; Inspector G. E. Fisher, Freeman, Ont.; Prof. F. M. Webster, Wooster, Ohio; Revs. Provost Watkins, and Dr. Bethune, London; Drs. Woolverton and Stevenson, and Messrs. J. A. Balkwill, J. H. Bowman, J. Dearness, H. Gould, B. Green, C. J. Fox, W. Gammage, W. H. Hamilton, John Law, Heard, J. A. Moffat, S. B. McCready, W. E. Saunders, R. W. Rennie, E. A. Brown, H. S. Saunders, and many other residents of London.

The President called upon the Directors and Officers of the Society, the representatives of the Branches, and the chairmen of the Sections for their respective Reports on the work of the past year. These were read and discussed, as follows:

REPORT OF THE COUNCIL.

The Council of the Entomological Society of Ontario begs to present its Annual Report for the years 1899-1900.

The thirty-sixth annual meeting was held in London in October 1899, and was well attended by members from a distance as well as by those resident in the city. An interesting and important addition to the ordinary proceedings was a conference held during the first afternoon on the San José Scale and the operations that had been carried out for its suppression in the Province of Ontario. A full report of the discussion and of the subsequent proceedings at the meeting has already been published; it is therefore unnecessary to enter into particulars.

The thirtieth Annual Report on economic and general Entomology was presented to the Minister of Agriculture for Ontario in December last and was printed and distributed in the following March. It contained 127 pages and was illustrated with sixty-six wood cuts and two plates, one a portrait of Mr. Henry H. Lyman the retiring President, the other exhibiting the structure of a butterfly's wing. Besides the account of the conference on the San José Scale and the proceedings at the Annual Meeting, it contained among many useful papers, the President's address by Mr. Lyman; "One hundred years of American Entomology" and "The home of the San José Scale" by Prof. F. M. Webster; papers by Prof. Lochhead, Mr. Arthur Gibson, Mr. J. A. Moffat, Dr. Bethune, Mr. W. N. Hutt, Dr. Fyles, and articles on the most notable and injurious insects of the year by Dr. Fletcher, Messrs. Harrington, Evans, Moffat, Gibson and Drs. Fyles and Bethune. An addition of much interest was the report of the proceedings at the first annual meeting of the North-West (Canada) Entomological Society, held at Lacombe, Alberta, in November 1899.

The *Canadian Entomologist* has been regularly issued at the beginning of each month. The 31st volume was completed in December last; it consisted of 377 pages, illustrated with 36 wood cuts and six plates. The contributors numbered no less than sixty, and included well-known writers in England, Germany, Finland, Brazil and Japan, as well as in the United States and Canada. The thirty-second volume will be completed next month; the eleven numbers already issued contain 352 pages and many original illustrations.

An index to the thirty Annual Reports of the Society, 1870 to 1899, has been prepared by the Rev. Dr. Bethune and is now being printed under the direction of the Department of Agriculture. It is expected to be ready for distribution before the end of the year, and will, undoubtedly, be found of very great value by all who have occasion to consult these Reports.

Entomological meetings have been held regularly on Friday evenings, at first fortnightly, afterwards weekly, from October to June, and have now been resumed for the autumn and winter seasons. The study of the Lepidoptera was taken up for several months and when spring opened specimens freshly captured were brought for identification and discussion. The order Coleoptera has been adopted for study during the sessions that have now begun.

The Council is glad to be able to report that the Ornithological Section has been revived and has held regular monthly meetings for a year past; at the same time it has to express its regret that no meetings of the Botanical Section have been held this year. The Geological Section has been as active as usual, holding weekly meetings on Tuesday evenings throughout the greater part of the year, and the Microscopical Section has held interesting meetings on alternate Friday evenings during the autumn and winter months.

Many valuable and interesting additions have been made to the Library and Collections. The Council desires to bear its testimony to the great care taken by Mr. Moffat in the preservation of the Society's books and specimens, and their neat and orderly arrangement. Too much praise cannot be accorded to him for the zeal and interest that he always displays in attending to the welfare of the Society and the good order of its property.

All of which is respectfully submitted.

THOMAS. W. FYLES, President.

REPORT OF THE LIBRARIAN AND CURATOR, FOR THE YEAR ENDING 31st OF AUGUST, 1900.

Thirty bound volumes of Government Reports, and proceedings and transactions of societies were received during the year. Among them were twelve quarto volumes of the United States Geological Survey, profusely illustrated, with a volume of maps accompanying them.

Thirty-four volumes were bound and added to the library. Among these are some volumes of the Bulletins of the Iowa University (a gift to the library by Rev. Dr. Bethune) one of which is of special interest, being explorations in the Canadian Far North in search of the Musk Ox, by Frank Russell. Also contributions from Drs. Fletcher and Bethune of volumes of the Proceedings of the American Association for the Ad.

vancement of Science, which complete the Society's set up to date, and make the number of volumes added during the year 64.

The full number now on the register is 1,691.

Number of volumes issued to local members was 45.

A few additional specimens of *Manitoba Lepidoptera* have been secured since the last report, which are valuable for reference and comparison.

Nothing of special interest in local captures can be reported for the past season. A few doubtful forms are awaiting determination. Mr. O. C. Poling, of Quincy, Illinois, has kindly and considerately presented to the Society, a fine pair of that rare, singular and interesting butterfly, *Neophasia Terlootii*, Behr., taken in Arizona.

Respectfully submitted.

J. ALSTON MOFFAT.

AUDITORS' REPORT.

Receipts and Expenditures of the Entomological Society of Ontario, for the year ending August 31st, 1900:

RECEIPTS.	EXPENDITURES.
Balance, September 1st, 1899.....\$ 576.30	Cork, pins, etc.....\$ 45.20
Sales of Entomologist..... 150.69	Expense acct., (Postage, etc.).... 159.79
Sales of Cork, pins, etc..... 93.58	Library..... 35.89
Advertising..... 14.35	Salaries..... 375.00
Government Grant..... 1,000.00	Annual Meeting and Report.... 254.60
Members fees..... 439.86	Rent..... 175.00
Interest..... 13.16	Printing..... 749.75
	Balance on hand Aug. 31st, 1900, 492.71
\$2,287.94	\$2,287.94

We, the Auditors of the Entomological Society of Ontario hereby certify that we have examined the books and vouchers of the Treasurer and find them correct, and that the above is a true statement of the accounts of the society.

W. H. HAMILTON }
JAS. H. BOWMAN } Auditors.

London, Ont., Sept. 18th, 1900.

REPORT OF THE MONTREAL BRANCH.

The 224th Regular and 27th Annual Meeting of the Montreal Branch of the Entomological Society of Ontario was held at 74 McTavish street on Tuesday evening, May 8th, 1900.

The members present comprised Messrs. A. F. Winn (Pres.), Henry H. Lyman, A. E. Norris, E. T. Chambers, J. C. Williams, G. Chagnon, G. Beaulieu, M. W. Davis, O. Stevenson, G. A. Moore, C. P. Newman and L. Gibb. Visitor—Rev. E. O. Trenholme.

The chair was taken by the President and the minutes of the previous meeting, and also of the last annual meeting, were read and confirmed.

REPORT OF THE COUNCIL.

The President then submitted the following report of the Council for the past year:

In presenting their report for the past year your Council is pleased to be able to state that much good work has been done.

Eight regular monthly meetings have been held, the average attendance being ten, and six new members have been added to our roll.

We have again had a visit from each of our good friends, Dr. Fletcher and Rev. Dr. Fyles, in addition we had the pleasure of having Mr. J. G. Jack of Jamaica Plains, Mass., at one meeting and one of our new members, Mr. E. D. Wintle of Como, P.Q., has come to our meetings regularly.

Two field days were held, the first at Beloeil Mountain, St. Hilaire, on May 24, which was very successful, many valuable specimens being secured; the other at Chateau-

guay on July 1st was made a most enjoyable outing, through the kind hospitality of Mr. and Mrs. Jack and their family, but the captures were disappointing owing to the strong wind which was blowing all day. Several members also attended the Natural History Society's field day at Montford.

The following papers were read at the meetings :

Retiring Address of the President—Henry H. Lyman.

Collecting at Electric Light—A. F. Winn.

Note on Emergence of *Telea polyphemus*—M. W. Davis.

The Genus *Hydroecia*—Dwight Brainerd.

Spiders—Rev. Dr. Fyles.

A Sketch of the Order Orthoptera—E. M. Walker (of the Toronto Branch).

Tribulations of a Beginner—Dwight Brainerd.

Practical Entomology, or Bee Keeping—Gilbert Wintle.

Bees and Wasps—Dr. Jas. Fletcher.

An Entomological Muddle—Henry H. Lyman.

Chrysophanus thoe—A. F. Winn.

On the Rearing of Lepidoptera—Arthur Gibson.

Danaus Archippus—A. E. Norris.

This list probably shows more diversity of subjects than that of any year in the history of the Branch, and the specimens shown at the meetings have included orders that have been little studied here in the past, such as Diptera, Hymenoptera and Orthoptera.

Our collection of books has again been added to by Mr. J. G. Jack, who has presented copies of the report on the Gypsy Moth and two volumes of Memoirs of the Academy of Natural Sciences. A case has been ordered for our books and pamphlets, and the Natural History Society have kindly consented to give us space for it in their building.

The Treasurer's statement shows the Branch to be in a good financial position, Respectfully submitted on behalf of the Council,

ALBERT F. WINN, President.

The Treasurer then submitted his report, showing a balance on hand of \$59.37.

It was moved by Mr. H. H. Lyman and seconded by Mr. C. Stevenson "That the reports of the Council and of the Treasurer be received and adopted." Carried.

The following officers were elected for the ensuing year: President, A. F. Winn; Vice-President, Dwight Brainerd; Secretary, Lachlan Gibb; Treasurer, M. Waring Davis; Librarian, A. E. Norris; Council, H. H. Lyman and G. Ohagnon.

Mr. Henry H. Lyman read a paper on the Life History of *Euchaetes Oregonensis*, and also exhibited a pamphlet entitled Memoirs of the Chicago Entomological Society.

A letter was read from E. Brunetti, London, England, asking for exchange in Canadian Diptera, which was referred to Mr. Ohagnon.

After examining a number of specimens shown by the members the meeting adjourned.

LACHLAN GIBB, Secretary.

REPORT OF THE QUEBEC BRANCH.

The annual meeting of the Quebec branch of the Entomological Society of Ontario was held on May 12th, 1900, the president, Rev. Dr. Fyles, occupying the chair.

PRESIDENT'S ADDRESS.

The Quebec branch of the Entomological Society of Ontario has entered upon the fourth year of its existence. During the past year several things have happened to occasion our members much concern.

Death has removed two from amongst us. Mrs. Treffry departed this life a few months ago; and on April 27th, Mr. Treffry after a very brief illness was also taken

away. We shall miss the active interest he took in our affairs. His ability as a journalist and his ready pen were often exercised in the interests of the Branch and his cheerful good-nature, before sorrow overtook him, added to the interest of our meetings.

Next we have to record the closing (temporary it is to be hoped) of Morrin College. The reduction of the grant from the Superior Education Fund, the inadequacy of the number of paying students to make up for this, and the failure of support from our decreasing English speaking population, militated seriously against its interests and made it impossible to maintain its very efficient staff of professors without trenching too far upon the capital funds of the Institution. We hope that the privilege of meeting in the College rooms will still be allowed us.

The late principal, Dr. Macrae, and Professors Clark, Gunn and MacIntyre took a kind interest in our proceedings; and in Professor Walters we have had a firm friend and valuable member. Should he be called from the city, we shall regret his departure deeply at the same time that we shall indulge the hope and heartily pray that health and prosperity may attend him and his family wherever their lot may be cast.

An untoward accident in the beginning of March interfered for two months with the regular course of the proceedings of the branch, but before that its meetings were regularly held and well attended.

Four field days were held in the course of the summer: two at the Gomin; one (by invitation) in the grounds of E. H. Wade, Esq., at New Liverpool and one at the Island of Orleans.

At the meetings in Morrin College, the following subjects were considered:—Noah's Flood and the Insect World: Ichneumon Flies; Dragon-Flies; "The Kissing Bug"; the Hemiptera; the Ceratocampidae and the Saturnians.

At one of the meetings a most interesting narrative of an entomological expedition to the country north of Brandon, Man., written by Mr. A. Hanham of Winnipeg, was read and fully appreciated. At another meeting many very beautiful southern moths presented to the president by Mr. H. H. Newcomb of Boston were exhibited and greatly admired.

Among the interesting captures of the season were: *Thyatira rectangulata*, Ottolengui, which was taken on the Island by Mrs. Turner; a fine specimen of the salmon-colored variety of *Hepialus argenteomaculatus*, Harris, taken at light at St. Paul, Quebec; *Catocala Bianca*, Hy. Edwards, also at light at Levis; and a very fresh specimen of *Ufeus Satyricus*, Grote, caught on the wing at the Chaudière, on the 20th of January by Mr. Charles Barclay.

A new pest has made its appearance in this province viz: the American Cockroach (*Periplaneta Americana*), a specimen of which was found at St. Paul, Quebec, on the 21st of April. This makes the fourth kind of cockroach that has shown itself in Quebec Province. The other three are the German Cockroach (*Ectobia Germanica*); the Oriental (*Blatta orientalis*) and the Australian (*Periplaneta Australasia*). All these insects are troublesome and disgusting, but they are incapable of inflicting personal injury. A very effective trap for them may be purchased in the hardware stores. Rapid and constant intercourse with all parts of the continent will doubtless bring many insects within our borders.

By far the worst pest that of late years has shewn itself in Canada is the San José Scale. Up to the present time it has not been found in the Province of Quebec; but in Ontario its ravages have occasioned much dismay. Fortunately the Ontario Government are aware of its dangerous character and are taking timely and stringent measures to check its course. The report of a very interesting discussion upon this scale is printed in the Society's Annual Report which will shortly be in the hands of the members.

It is to be hoped that the coming season will be a favorable one from an entomological point of view; that no troublesome insects may increase to cause alarm and that many rare and beautiful specimens may reward the efforts of our collectors.

REPORT OF COUNCIL.

The branch now includes 43 members: 33 adults and 10 juniors.

The Treasurer's report gives a very satisfactory showing.

Several excursions were made during the year and were very successful.

Owing to an accident to our worthy president the course of lectures had unfortunately to be interrupted to the great regret of the members.

Our thanks are due to the authorities of Morrin College for having continued to allow us to use their rooms for our meetings.

H. WALTERS, on behalf of the Council.

It was moved by Miss Hamel, seconded by Mrs. Poston, and unanimously resolved that the thanks of the meeting be tendered the council and the officers.

The following were then elected :

President, the Rev. Dr. Fyles.

Vice-President, Miss E. MacDonald.

Council, Mrs. R. Turner, Mr. James Geggie, Professor Walters, Hon. R. Turner, Miss Bickell, Miss Winfield.

Secretary-Treasurer, Lt.-Col. Crawford Lindsay.

Curator, Prof. Walters.

Since the above report was written Morrin College has been re-opened, and has a large attendance of students. The Quebec Branch of the Entomological Society of Ontario has commenced its regular work and is in a very healthy condition. At the last meeting twenty-two members were present and four new members were elected. Before the close of the season it held a happy field-day in the grounds of James Geggie, Esq., at Darnoc, Quebec.

THOMAS W. FYLES,

President of the Quebec Branch.

REPORT OF THE TORONTO BRANCH.

The fourth annual meeting of the Toronto Branch of the Entomological Society of Ontario was held in the Education Department (Normal School), on Friday evening, the 6th April, 1900.

The following members were present : Messrs. E. M. Walker (Vice-President), G. M. Stewart (Secretary-Treasurer), H. C. Austin (Librarian), D. G. Cox, R. J. Crew, C. H. Tyers and S. R. Carter ; visitor, Mr. A. Cook.

In the absence of the President, the Vice President took the chair.

The minutes of the previous regular meeting were read and approved.

Messrs. Geo. Smith, Geo. Rossiter, Albert Cook and W. H. Harrison were duly elected members of the Branch.

The Secretary read the following report of the Council for the year ending 31st March, 1900 :

REPORT OF COUNCIL.

The Council of the Toronto Branch of the Entomological Society of Ontario take much pleasure in presenting the Fourth Annual Report of the proceedings of the Branch for the year ending 31st March, 1900.

They are pleased to report that since the last annual meeting the membership of the Branch has been increased by the addition of one new name, viz, Mr. D. G. Cox, and as some of the meetings have been attended by visitors, no doubt others may be induced to take an interest in our work in the near future.

During the past year fifteen regular meetings have been held in the Education Department, with a fair average attendance of the members. The Council is pleased at the result of Mr. Lyman's suggestion that papers be exchanged between the Toronto and Montreal Branches, and is much indebted to the members of the latter Branch for the interesting papers so kindly contributed. As a partial return, Mr. Walker's paper, mentioned below, was forwarded to be read before the Montreal Branch.

The following is a list of the papers read before the Branch during the past year :

Annual Address of the President, Mr. R. J. Crew.

Notes on Danais Archippus, Mr. H. H. Lyman, of the Montreal Branch.

A Sketch of the Order Orthoptera, with special reference to the Ontario Forms, Mr. E. M. Walker.

Collecting at Electric Light, Mr. A. F. Winn, President of the Montreal Branch.

The Rearing of Lepidoptera, Mr. Arthur Gibson.

Notes on the Anatomy of *Belostoma*, Mr. G. M. Stewart.

An interesting feature of the year's work was an open meeting held on the 5th of January, at which a large audience was present, including many Normal School students. Dr. Fletcher, of Ottawa, Dominion Entomologist, gave a most interesting lecture on "Bees and Wasps." Dr. Bethune, of London, editor of the *Canadian Entomologist*, also gave an interesting address on the aims of entomology, and spoke of the work being done by the Entomological Society of Ontario and its Branches.

During the year several field days were held and many interesting captures were made.

The work of classifying the collection of insects made by the Branch for the Education Department is progressing well, and it is gratifying to know that the species already collected and donated have been transferred into the cases, in the Department. During the coming season the Council would urge the members to collect largely so that by next winter the Department may be in possession of a fairly good reference collection of the insects of Ontario.

The report of the Librarian shows that many valuable Government publications have been added to the library, also that two periodicals have been subscribed for, and several books purchased during the year.

The Treasurer's report shows a small balance carried forward on the right side.

Respectfully submitted on behalf of the Council.

ARTHUR GIBSON,
President.

The report of the Treasurer was then presented, as was also that of Mr. Austen, as Librarian, and on motion the reports of the Council, Treasurer and Librarian were duly adopted as read.

The election of officers for the ensuing year resulted as follows: President, Mr. D. G. Cox; Vice President, Mr. E. M. Walker; Secretary-Treasurer, Mr. G. M. Stewart; Librarian, Mr. H. C. Austen; Members of Council, Messrs. R. J. Crew and O. N. Tyers.

The address of the retiring President, Mr. Arthur Gibson, was read by Mr. Walker, Mr. Gibson, owing to his duties as assistant in the Division of Entomology at the Central Experimental Farm, Ottawa, being unable to be present. The work of the Branch since its inception was reviewed, particular attention being made of the year just ended. The members were urged to make extra efforts the coming summer to collect and mount specimens for the collection which the Branch is forming for the Educational Department for Ontario. The latter portion of the address took the form of a practical illustrated paper on "The Preservation of Larvæ by Inflation."

A vote of thanks to Mr. Gibson for his interesting address was carried.

The meeting then adjourned.

G. M. STEWART,
Secretary.

REPORT OF THE MICROSCOPICAL SECTION.

A meeting for the organization of the Section was held on November 4th, 1899, and the following officers were elected for the ensuing year: W. E. Saunders, Chairman; S. B. McCready, Secretary; J. A. Balkwill, J. Dearness and J. H. Bowman, Committee.

During the season eleven meetings were held, with an average attendance of seven, besides occasional visitors. At each meeting interesting subjects were discussed and the objects referred to examined under the microscope; five papers were read, viz.:

The Protoplasmic Cell—J. H. Bowman.

The Multiplication of Cells—J. Dearness.

The Protoplasmic Cell—J. Dearness.

Micrometry—J. H. Bowman.

The Natural History of Florida—W. E. Saunders,

One meeting was given over to the examination of freshly collected living organisms, two to the examination of exceedingly beautiful chemical crystals, prepared on the spot by Mr. Bowman, and one to the discussion of fermentation.

At the fourth meeting Mr. Thos. Beall, of Lindsay, brought before the members the desirability of forming a Horticultural Society in London. The project was highly approved of and energetically taken up, resulting in the formation of the very successful and enterprising London Horticultural Society.

W. E. SAUNDERS,
Chairman.

REPORT OF THE ORNITHOLOGICAL SECTION.

The reorganization meeting of the Ornithological Section of the Entomological Society was held on January 13th, 1900. Officers were elected and an outline of plans was made for the season. Monthly meetings were adopted, omitting July and August. This programme has been strictly adhered to. Nine meetings have been held, at which the average attendance has been five, and ten papers have been read, entitled as follows:

"New Birds for Middlesex and Ontario," W. E. Saunders; enumerating six species new to Ontario and eight species new to Middlesex County, all taken since the last meeting in 1894.

"An Ornithological Incursion into Florida," W. E. Saunders.

"The Sparrows of Ontario," J. E. Keays; enumerating the generic and specific peculiarities of each species, with notes on their habits, fully illustrated by specimens.

"The Cubic Contents of the Eggs of the Common Buteos," J. E. Keays.

"The Nesting of the Sharp Shinned Hawk," H. Gould.

"The Flycatchers of Ontario," W. E. Saunders.

"The Grebes and Loons of Ontario," W. E. Saunders.

"A Trip to Point Pelee," H. Gould; illustrated by specimens.

"A New Song for a Common Bird," W. E. Saunders.

"Seasonable Changes in the Food of Sparrows," J. E. Keays.

Two of the above-named papers have been published and others will be in the near future. Besides these, short notes on interesting subjects have been presented, one recording the capture of two specimens of the Long-tailed Jaeger, at Rondeau,—the first for Ontario.

The spring arrivals have also been closely recorded, 144 species being noted by members up to May 26th. Dates of the fall migrations are also being prepared and are now about complete.

A number of fine sets of eggs have been taken by the members, the best of which were six sets of the Sharp Shinned Hawk, and five sets of the Cerulean Warbler. An account of the work done on this bird was published in *The Auk* for October.

Bird protection in London was also taken up, and notices published in the papers that wanton destroyers of our native birds in the parks would be prosecuted, which notice accomplished the cessation of some shooting which had previously been going on.

All the choice new material taken by the members has been exhibited by them at the meetings, which have been interesting and enthusiastic.

J. E. KEAYS,
Chairman.
W. E. SAUNDERS,
Secretary.

REPORT OF THE GEOLOGICAL SECTION.

The Geological Section of the Entomological Society of Ontario begs leave to present its annual report as follows:

The section with Dr. Wolverton as chairman continued its meetings weekly as usual, with but a short holiday, throughout the year. The interest in Geological study

was well maintained. The Huronian rocks with many of their characteristic minerals formed the principal study, while local fossils and minerals of the Devonian period received due attention. Visits for the purpose of securing specimens were made to interesting localities in Ontario and Michigan, by members of the Section, and our table was frequently well supplied with the essentials of this department of Nature Study.

The Society mourns the loss of one of its charter members, Mr. Thos. Green, who passed away at the ripe age of eighty-seven years. His brother, who is over eighty years of age, is still a member of our Section. Until a short time before his death, Mr. Thos. Green was an energetic student of Nature, and materially added to the profit of our meetings.

The Chairman reported as follows: "I have made a special trip to Manitoulin Island and the Georgian Bay District for the purpose of obtaining characteristic fossils and minerals of these regions, as a basis for the study of the Huronian formation during the winter. I travelled in all by water 450 miles, and secured a great variety of vein matter consisting of quartz, mica, plumbago, feldspar, molybdenite, bornite and other copper ores, as well as many specimens of corals.

Manitoulin Island abounds in fossil coral, and good specimens were obtained, as you may see from the collection before you. We will make a detailed study of these during the ensuing year."

Our Chairman and Mayor Rumball of this city, also visited a farm in West Nissouri township to inspect the remains of what was one of Earth's most mighty creatures. During the Western Fair this year there were exhibited about thirty bones of gigantic size supposed to be those of a Mastodon or some closely related species of that class. Owing to the absence of teeth and most of the bones of the head, it has not been identified so far. These bones were uncovered recently by some men while excavating a drain through a peat bed, and are in a good state of preservation. The tusk measures more than nine feet in length. It is curved like a cow's horn and tapers to a point. The corrugations on the tusk where it entered the head are easily discernible. The femur is three feet in length and where it entered the socket, it is three feet in circumference. The tibia and fibula are well preserved and the foot bones are entire. Four ribs of large size are made to articulate with the vertebrae by ball and socket joints, attesting the great antiquity of the fossil.

From the position in which the bones were found, it would appear, that the giant becoming mired in the bog fell over and lodged probably against some partially submerged log and strangled. From a careful inspection of the locality where the bones were found our Chairman thinks other parts of the skeleton may yet be discovered, as no thorough search has yet been made. It is hoped by many citizens, as well as by the members of our Section, that London may be the final resting place of these interesting remains.

Efforts are now being made to establish a public museum in the city in connection with the Free Library. The question has been mooted in the press, and was thoroughly discussed at a meeting of the Library Board, and there is reason to hope that this treasure will not be allowed to leave our district.

In connection with the museum, Dr. Wolverton and other citizens have offered to loan valuable collections for a term of years and as only a small expense would have to be incurred in fitting up the rooms in the library building, there would appear no sufficient reason why we should not have this important means of education secured to us.

Our correspondent, Rev. Dr. Philp, of Petrolea, sent us two very interesting accounts of trips he made to points in Lambton County. The first was to a point near Shetland on the Sydenham about eight miles north of Bothwell, to inspect the shale beds which he found exposed there for some distance along the river bed. They belong to the Portage Chemung group. The shale is very dark, almost black, bituminous and filled with nodules of iron pyrites. These shales are beautifully stratified and "we were compelled," he says, "to think of ice sawn for storage." The shale in every respect resembled that at Kettle Point. Fragments of very large concretions (Kettles) were discovered, hemispherical in shape, the tops apparently cut off by the ice when the water was about sixteen inches higher than at present. We also found in the vicinity several kettles firmly embedded in the shale, each of them five feet in diameter.

A little further north we came upon two outcrops of limestone each about seventy feet in length; one runs parallel with the river and the other at right angles. On each side of these outcrops kettles are ranged. These vary in size and shape. They are from one-half to two-thirds of complete globes. Crevices in the limestone are filled with material of the same composition as the concretions. Though we searched diligently for impressions of calamites we did not succeed in finding any at this place.

At a place three miles up the Sydenham from Shetland the Lambton limestones are exposed. They are very fossiliferous and are crowded with *Spirifera Mucronata*.

The Rev. Jos. Philp also visited the Enniskillen gum beds and reported to us his findings, and sent a fine specimen of what he terms mineral Caoutchouc. It was obtained from lot 16, second con., Enniskillen, near Oil Springs.

The bed is situated on the surface, and is quite extensive, though much of it has been removed and used as fuel for steam raising. With a fan blast it burns well. In appearance it resembles tar. It is almost jet black, dense and solid, somewhat resembling asphalt. People select the cleaner parts and use it as chewing gum. They say it is better than it looks. It is probably of the same origin as the petroleum found in the same vicinity.

Mr. Philp also examined the bituminous shales of Alvinston which are exposed at that point for nearly a mile along the river. They belong to the Portage Chemung group. He found one impression of a Calamite, very distinct. The stratification and the cleavage are noteworthy and the nodules of iron pyrites are very beautiful. At this point there is no trace of a kettle. He thinks the kettles are found only in the lowest portion of this formation. At least that is the case at Shetland, where the older strata are exposed.

THE LAKE SUPERIOR COPPER MINES.

Mr. Goodburne, who visited the Lake Superior copper mines in October, 1899, read a paper descriptive of that region, opening with a brief description of copper and its ores. The first record of the discovery of copper in the Keeweenaw Peninsula, Michigan, was in 1636, and from that date its history was traced down to the present day. Mining, however, dates only from 1831, when Dr. Douglass Houghton, while a member of the Schoolcraft expedition, first made known the great wealth of the peninsula, and in 1834, the government first opened up the country to mining. From a review of the history of early mining, Mr. Goodburne proceeded to a description of the principal mines, chief interest centering in the great Calumet and Hecla, which yields 100,000,000 pounds of refined copper annually from the conglomerate lode underlying 20 acres of surface, a product valued at \$18,000,000, taken from under land, which originally cost \$1.25 per acre, or \$25.00 for the most valuable copper mine in the world.

The great Keeweenawan formation consists of a series of eruptive beds, alternating in the upper division with sandstone and conglomerates, the whole lying above the Huronian slates, schists and metamorphic rocks. The formation was, probably, originally horizontal at the bottom of the ancient sea. The system to the east is the Medina division of the Silurian formation, a time when great volcanic forces disturbed the earth; but it was probably the subsequent movements of the crust which tilted the beds so as to form a great trough or synclinal. The eastern edge is on the end of Keeweenaw Point, and the western across the Minnesota border. Michipicoten Island and the Nepigon district are on the reverse, or northern, fold of the synclinal, for while the Michigan edge dips toward the northwest, the northern edge dips in the opposite direction, but it is very much broken by depressions, and not so easily traced as the southern edge. The lower beds of the Keeweenawan formation consist mainly of a series of coarse crystalline gabbros, from 20 to 50 feet thick. There are 4,000 or 5,000 feet of these lava flows, after which the eruptions became somewhat different in chemical character, and more frequent, with thinner flows. These flows contain the copper. The lava is generally basic, like basalt, but acid and intermediate types are present. Among the typical kinds may be mentioned gabbro, diabase and melaphyr, including the amygdaloidal examples of the two latter, in which is the copper. Other rocks are the acid lavas, including felsites and porphyries, which have furnished much of the detritus for the sandstones and conglomerates, and these acid lavas, which do not flow as far or so freely as the basic, quite often trend across the other rocks in the form of dikes or bosses, with dome-like summits.

The copper occurs in the trap formation, which cuts the centre of the peninsula, and continues its course southward through Ontonagon county, extending westward through Wisconsin, to the western shore of Lake Superior, thence northward to Isle Royal, where it disappears on the mainland, appearing again in the Nepigon district. In all these places the geological characteristics are the same, thin sections of rock from one district being scarce distinguishable from a specimen taken from another. Eastward, the copper is found on Michipicoten Island, and the formation is traceable at Gros Cap, a few miles from Sault Ste. Marie.

The copper is not an ore, but is the virgin metal, all the paying mines being opened on lodes which carry native copper. There are a few fissure veins in Keeweenaw County (on the north of the peninsula), which carry grey sulphurets producing as high as 25 per cent. refined copper. All the mines produce considerable amounts of native silver, and the Quincy Company reduces its mineral by electrolysis in order to save the silver, which averages 38 ounces to the ton of copper.

When the lava flows rested under the ancient sea, the interstices in the frothy portion were filled with copper by electro-chemical action, forming the amygdaloidal rocks. The conglomerates are ancient sea beds, formed of boulders, sand and gravel, broken from the surrounding rocks of the ancient sea. These also had interstices, and were filled with copper in the same manner.

That the copper was carried in solution and arrested in its present position by some precipitating agent is conceded by most authorities; and that it was intimately associated with the melaphyrs that have had their ferrous iron changed into a ferric state by taking up more oxygen, has given rise to the now widely accepted theory that in the peroxydation of the ferrous iron is to be found the agent of precipitation. The origin of the copper is not so easily explained. One theory is that the copper was brought to the surface by the lava flows; another that it was deposited in a sulphuretted form, along with the detrital rocks of the period.

Mr. Goodburne illustrated his paper with diagrams of the district, showing the synclinal, and the position of the mines; and exhibited many beautiful specimens of copper and silver, from the form in which it was mined, until the copper was gathered from the great stamp mills.

We offer a suggestion to the other sections of our Entomological Society.

As it is difficult to secure members to replace those lost owing to removals, deaths and other causes, we would suggest occasional public meetings under the auspices of the parent society at which there should be a programme of addresses on subjects relating to nature study illustrated where practicable by views. These public meetings would advertise our society and would tend to increase both the interest and profit of the meetings.

G. KIRK,

Sec. pro tem.

REPORT FROM THE ENTOMOLOGICAL SOCIETY OF ONTARIO TO THE ROYAL SOCIETY OF CANADA,

Through the Rev. C. J. S. Bethune, D. C. L., Delegate.

During the year that has gone by since our last report to the Royal Society, the Entomological Society of Ontario has pursued the even tenor of its way and continued its useful and scientific work. There are no striking events to record, but much has been done of permanent value and additions have been made to the general store of the knowledge of insects and their ways.

The thirty-sixth annual meeting of the Society was held in October last at its headquarters in London and was especially noteworthy for the conference that was held on the important subject of the San José scale. Those who took the principal part in it were Prof. James, Deputy Minister of Agriculture for Ontario; Dr. Fletcher, Entomologist and Botanist of the Experimental Farms of the Dominion; Mr. J. Dearness, one of the special commissioners appointed by the Ontario Government to investigate the

ravages of the scale in this Province; Mr. G. E. Fisher, Official Inspector; Professor Lochhead of the Ontario Agricultural College at Guelph, and Professor Webster of the Ohio State Agricultural Experiment Station. The proceedings at the Conference are published in full in the 30th Annual Report of the Society, which was presented to the Legislature of Ontario at the opening of its last session.

The Report also contains a number of valuable and interesting papers and is illustrated with sixty-six wood-cuts, many of them drawn specially for the purpose, a portrait of Mr. Henry H. Lyman, the retiring President, and a plate representing the structure of a butterfly's wing. Among the papers may be mentioned the following: "The President's Annual Address," by Mr. Henry H. Lyman, Montreal, in which the formation of an entomological union for the authoritative settlement of questions of nomenclature especially, was strongly advocated; an account was given of the importance of accurate descriptions of larvæ and the difficulties to be surmounted in making them; a short review was made of the principal work of the year in both economic and systematic entomology, and some account of recent publications was given. "One Hundred Years of American Entomology," "The Native Home of the San José Scale," and "Some Notes on the Larval Habits of the Gray Hair Streak Butterfly," by Prof. F. M. Webster. "Notes on some Insects on Coniferous Shade Trees," "Injurious Insects of the Orchard, Garden and Farm in 1899," "Nature Study Lessons on the Cabbage Butterfly," by Prof. W. Lochhead, Guelph. "Spiders," by the Rev. Dr. Fyles, South Quebec. "The Wing Structure of a Butterfly," and "Remarks upon some Cuban Insects," by Mr. J. Alston Moffat, London. "Fatal Bite of an Insect," and "Some Observations of a Bumble bees' Nest," by Rev. Dr. Bethune, London. "Injurious Insects in Ontario During 1899," by Dr. Fletcher, Ottawa. "The Electric Light as an Attraction to Moths," by Mr. A. Gibson, Ottawa. "Asparagus Beetles," by Mr. W. N. Hutt, Southend.

The volume contains the reports on the work of the preceding year by the different officers of the Society, the Geological and Microscopical Sections at London, and the flourishing branches in Montreal, Quebec and Toronto. There are also valuable "Notes on the Insects of the Year," by the Directors, Messrs. Harrington, Evans and Gibson, in their respective territorial divisions, and by Messrs. Moffatt, Bethune and Fyles on the season of 1899.

The report concludes with an account of the first annual meeting held at Lacombe, Alberta, in November last, of the new and vigorous North-West (Canada) Entomological Society, which is fortunate in having Mr. Percy B. Gregson, of Waghorn, as its energetic President. The report of its council, the President's address, and papers by Dr. Bethune on "The use of Entomology;" Dr. Henry George on "The Pocket Gopher," and an address by Mr. Henry H. Lyman, are published in full.

The librarian states that the library of the Society now contains 1 627 bound volumes, besides a large number of pamphlets and periodicals. The chief additions to the cabinets of insects have come from Manitoba and Cuba.

Four distinguished entomologists were elected honorary members of the Society, viz: Dr. L. O. Howard, United States Entomologist, Washington, D. C.; Professor John B. Smith, Sc.D., Rutgers College, New Brunswick, N. J.; Professor F. M. Webster, Wooster, Ohio; and Professor H. F. Wickham, M.A., Iowa City, Iowa.

The Society has continued to publish its monthly magazine, "The Canadian Entomologist," which was begun in 1868, and of which the thirty second volume is now being issued. The thirty-first volume was completed in December last and consisted of 380 pages illustrated with six photo-gravure plates and thirty-six wood-cuts; thirty new genera of insects are described and ninety-two new species. The contributors number sixty, of whom sixteen are residents in various parts of the Dominion, thirty-nine in the United States, and one each in England, Germany, Finland, Brazil and Japan. Among the large number of important papers may be mentioned the descriptions of Coccidæ from both North and South America by Professors Cockerell and Tinsley, and Messrs. Ehrhorn, Parrott, King, Hempel (Brazil) and Marlatt.

Papers on Classification: The Entomophilous Wasps by W. H. Ashmead; Dragon Flies by Jas. G. Needham; North American Myrmelionidæ by N. Banks; Coccidæ by Prof. T. D. A. Cockerell; Bees by Chas. Robertson; Wasps by S. N. Dunning; descriptions of new species: Lepidoptera by Prof. J. B. Smith, Dr. H. Skinner and Dr. H. G. Dyar; Orthoptera by Dr. Samuel H. Scudder and Jerome McNeill; Hymenoptera by

Carroll Fowler and W. H. Harrington; Diptera by D. W. Coquillett; Neuroptera by Rolla Currie; and Hemiptera by A. L. Quaintance and Otto Heidemann.

A list of Manitoba Moths by A. W. Hanham; the Coleoptera of Canada by H. F. Wickham; Ontario Acrididae by E. M. Walker; Canadian Lepidoptera by J. A. Moffat, T. W. Fyles and E. F. Heath.

Papers of an Economic character by Enzo Reuter (Finland), M. Matsumura (Japan), F. M. Webster, R. H. Pettit, W. Lochhead, E. A. Carew-Gibson, and others.

From the foregoing list, which does not include short notes, book notices and other items of interest, it will be seen that the magazine covers the whole field of systematic entomology and contains articles of importance by well-known authorities on most of the orders of insects. It has become so necessary to the working Entomologist that there is a constant demand for complete sets of the volumes from the beginning and the Society has in consequence been obliged to reprint several of the earlier numbers.

SAN JOSÉ SCALE DISCUSSION.

At the request of the President, Mr. G. E. FISHER, of Freeman, Ont., the Provincial San José Scale Inspector, stated that he was present by direction of the Ontario Department of Agriculture, and was willing to give any information at his disposal with regard to the prevalence of the San José scale in the Province, and the work which had been done during the past season. He regretted to say that the state of affairs was not as favourable as he could wish, and that the scale was now known to be present in many districts where it had not been discovered last year. Many experiments had been tried by instruction of the Department to see if a practical remedy could be discovered to control the insect instead of the drastic measure of cutting down the trees. He was glad of the opportunity to let the members of the Entomological Society know what the general trend of his experiments had been. To begin with he would make the statement that the infestation of Ontario orchards by the San José scale was a far more serious matter than fruit growers of the Province yet realized.

The following is a condensed summary of Mr. Fisher's address:

A great deal was said at the last annual meeting of the Society about the value of whale-oil soap as the best remedy for the San José scale, and particular mention was made of the satisfactory condition of orchards now standing on Catawba Island, which had formerly been badly infested by the scale. I therefore took great pains during the past summer and carried out many careful experiments with this material, using the strength recommended as the best, namely, 2 lbs. of whale-oil soap to one gallon of warm water, as well as other quantities. When a tree was known to be infested it was treated thoroughly with 2 lbs. to the gallon, and all trees in the immediate neighbourhood were also sprayed with a solution of $1\frac{1}{2}$ lbs. to the gallon. On other trees kerosene emulsion or crude petroleum were used, and careful notes taken of their effects upon the tree and the scale. With regard to the soap, the results were rather disappointing. In no case was the scale entirely eradicated, even when the soap was applied with the greatest care, according to the formula. Some trees where the full strength of 2 lbs. to the gallon was used are still infested, and the infestation is of about the same extent as at the beginning of the season. The scale was certainly reduced on cherry trees, and it was noticed that the soap had an excellent effect in clearing these trees of aphids. The treatment was applied just at the time the buds were bursting, when most people would think it was too late to use it without doing injury to the trees, but I found that no harm was done even when many of the blossoms were open. As a rule there is too much blossom on trees, and if some of this is destroyed it is an actual advantage, therefore this late spraying may be very beneficial. We have noticed that the young scales will move out on to a part of the tree which had been sprayed in the spring with the soap mixture, and will settle there and multiply. On the 18th August last I made an application, at Niagara, on a very badly infested tree, one, in fact, which was entirely covered by a moving mass of young crawling scale insects, walking all over the tree trying to find a place to settle. The soap was applied to the tree with a whitewash brush, with the object of finding out how reliable the soap was, and a little later a second application was made. I examined the tree again about the middle of November, and I think I had the nicest example of

the multiplication of the scale that could be found. The soap had killed the scale in the first place, of course, but the tree was just now in the same condition as when it was first applied, and the scales were multiplying on the part which had been washed with the soap. Below the untreated portion and for probably a foot and a half down over the part which was washed with soap, the larvæ were coming down in great numbers and there were actually mature females giving birth to young. This shews that washing with soap will not deter the scale insects from settling there and starting new colonies. In the middle of September I took my knife and scraped off the scales from a space one inch by two, clearing the bark entirely, and in two days this space was again entirely covered so that no bark could be seen. In the middle of October the same experiment was tried and the only difference was that it took twice as long for the space to be occupied again by the scales.

Kerosene also has been somewhat unsatisfactory. Trees have been killed and the scale does not seem to have been cleaned up. Crude petroleum has I think on the whole given the greatest satisfaction. Where it was applied on apple trees I have seen no bad results. I applied crude petroleum in one orchard to about 40 apple trees and 100 plum trees without in any way injuring a single tree. This was done about the middle of May. The trees were entirely freed from the scale and all that had been alive during the winter previous were cleared off. Case-bearers and many other insects were also destroyed. The material used was a mixture of 25 to 30 per cent crude petroleum with water, and applied as a spray. I am of the opinion that a mixture of half the quantity of soap recommended and half of crude oil in a combination pump would be preferable to either used alone. The crude petroleum will kill the scale insects but if applied in considerable quantities is apt to injure the peach and other tender trees. Great care should be exercised in applying it as advised. The soap alone is not a strong enough application, it does not kill enough of the scales. I do not think it would be safe to recommend crude petroleum for general use. People did not use whale oil soap in accordance with instructions given and the chances are they would not follow instructions when using crude oil, and thus trees would be killed. Judging from the experience of the past year I think some of the reported cases of injury by crude petroleum may be due to the way in which the substance has been applied. It must be borne in mind that no portion of the tree should be covered more than once by the spray or the oil will accumulate from each spraying until there is sufficient to injure the tree. I notice frequently when people are spraying that they begin on the trunk then spray the branches and when finishing bring the nozzle down again on to the trunk thus giving that part of the tree a double dose of the oil. This carelessness I think is the cause of much of the injury reported. The way that we spray is as follows: The pump is placed on an ordinary stone boat, one man sprays in one direction and one in another, and each tree is sprayed from four standpoints, or in other words as it is approached and as it is left behind in passing down the rows on each side of it. There is one part of the tree which is frequently overlooked when spraying, that is the upper side of the limbs on the opposite side of the tree to that which is being treated. This can only be reached by pushing the nozzle into the head of the tree and spraying over to the opposite side. (Mr. Fisher here passed around the meeting, specimens of infested wood, which had been cut from trees which had not been treated at all, and others from those treated with 2 lbs. of whale oil soap to the gallon or which had been sprayed with a 30 per cent mixture of crude petroleum. It was noticed that all these had some living scales on them.) In summing up the matter of remedial treatment I think the best results will follow if work is done in the month of April both with whale oil soap and petroleum applications. A perfect remedy should remain fresh for a long time, it must penetrate easily and must of course destroy the scales without injuring the tree. Soaps made entirely with potash are the best—soda makes a hard soap which solidifies on the trees. I have never seen an apple tree which was in any way injured with crude petroleum applied of the strength I have mentioned. The whale oil soap from Catawba Island has done the best work and it was only in the case where this Ohio soap had been used that the infestation did not increase. In the case of the other soaps tried the infestation has increased beyond what it was last spring. Many people did not know of the presence of the San José Scale in their orchards until they found it on the fruit. Almost the whole of the Niagara district is now infested with the scale and it is also very prevalent in the Guilds section where

little has been done to check it. The San Jose Scale has spread much during the past season and it is now abundant where it was hardly noticeable last year. It seems to me as if this scale question is going to develop into a great national calamity, and the time will come I fear when our grandchildren may have to tell their children of the good old times in Ontario when people used to be able to grow apples and other fruits.

With regard to the work of the scale it was formerly claimed that the fruit of the peach would not be injured on account of the fuzzy down upon its surface, but during the past summer I have seen peaches so covered with scales as to have the appearance of red apples, from the discoloration due to the injurious presence of the insect. —

Mr. Fisher here gave a review of the history of the San José Scale in Ontario and the excellent work that had been done by the Government in fighting it and protecting the fruit growers from loss. He was glad to find that public opinion was changing rapidly with regard to the work that was being done. He said "at Niagara, particularly, everybody is realizing that a very great danger threatens them and that something must be done or their interests will be destroyed. The fruit interests in Ontario are very great. One gentleman in St. Catharines sold \$10,000 worth of peaches in 1899 and another at Niagara sold over \$4,000 worth this year, and these peaches do not by any means represent their whole crop of fruit, as there are plums, cherries, pears, apples and small fruits beside. Some years of experience have taught us that when once we discover the San José Scale in an orchard no idea can be formed without close examination as to the extent of the infestation. In 1899 one orchard was examined carefully and 87 trees were marked—about the middle of this summer I visited this orchard and traversed it from one corner to the other, and I found the scale on every single tree I examined, and moreover on the very first twig I took hold of in every case. A good deal has been said about the rate at which scales can travel, and I am sure that this has been underrated. I have watched them a great many times and find that the young larvae can travel an inch in a quarter of an hour so that in a week they could travel half way across an orchard, and if blown to the ground I am quite sure they are capable of getting back again on to the tree. In addition to this there is no doubt they will crawl on to everything that moves and by that means will be carried in every direction. The increase of the scale is very rapid indeed towards the end of the season, especially during the month of September. Notwithstanding all that I have said, and remembering the state of affairs on Oatawba Island, it would seem that if an orchard is treated conscientiously and regularly the scale will not exist in sufficient numbers to materially mar the crop of fruit. This is particularly true of the early varieties, which are practically developed before the season of the greatest increase of the scale. I may mention that during the past season I have noticed a very large number of the little black lady-bird beetles (*Pentilia misella*) which have done such good work in feeding on the scale.

Dr. Fletcher congratulated the Society on having Mr. Fisher present at the meeting. His excellent and careful work on the San José Scale was well known. He was somewhat disappointed at the results of Mr. Fisher's experiments with whale oil soap. This remedy was an extremely valuable one, he had used it a good deal and considered that a good caustic potash fish oil soap such as the Ohio soap made by Mr. Owen, was one of the very best remedies against plant lice and bark lice of all kinds, moreover the amount of potash 12% was sufficient to act as a decided fertilizer to the trees. Many have noticed the good effect of this soap upon trees where it had been used. It was also claimed by the manufacturers to be an excellent remedy against the Peach Leaf Curl and some other fungous diseases. He considered that the thanks of the Society were due to the Honorable Minister of Agriculture for instructing Mr. Fisher to attend the meeting and to Mr. Fisher himself for the valuable and practical address he had given. Everybody who heard Mr. Fisher knew that he himself believed every word he stated, and that every experiment he recorded had actually been carried out by himself.

Prof. Webster, of Wooster, Ohio, spoke in complimentary terms of Mr. Fisher's address and said that his information was so valuable because he told us what he had seen with his own eyes, not what he had learned from others. He himself was afraid to recommend crude petroleum for general use as he had known of several instances of injury to trees, but doubtless many successful experiments had been put on record.

A general conversation then took place on the subject of the San José Scale, and all united in the belief that the attack upon our fruit-trees is a most serious one and that

the owners of orchards in the infested districts should be warned of their danger and urged to take prompt and effective measures for the repression of the pest. A hearty vote of thanks was given to Mr. Fisher for coming to the meeting and affording so much useful information.

EVENING MEETING, WEDNESDAY, NOV. 14TH.

The meeting was called to order by the President, the Rev. Dr. Fyles, who spoke of the successful gathering the night before when we joined with the London Horticultural Society in a most popular and most interesting meeting. It was quite proper he thought that the consideration of Horticultural topics should take precedence of Entomological, for Adam tilled the garden of Eden before the animals were brought before him to be named. He then gave some amusing instances of the tremendously long names that some of Adam's entomological descendants had been inflicting upon innocent species of insects.

ANNUAL ADDRESS OF THE PRESIDENT.

BY THE REV. T. W. FYLES, D. C. L., F. L. S., SOUTH QUEBEC.

At our annual meetings, Injurious Insects—their ravages and how to check them, have very properly received a great deal of attention. In a population such as ours, largely engaged in agricultural, horticultural and fruit-growing pursuits, such subjects are of never failing interest; and our economic entomologists when they treat of them are very sure to receive attention. To-night I venture to direct your thoughts to a different phase of insect life, and to operations that are beneficial to vegetation; and I trust that we shall spend a short time pleasantly in the consideration of our insect friends, and the offices they serve for promoting the fecundity and improvement of plants.

Dr. Gray did so much to bring the science of Botany into popularity on this continent, and in Canada our excellent public schools have so effectively taken the subject into the curriculum of school-work, that now, when addressing an audience upon the instrumentality of insects for the fertilization of blossoms, it is hardly necessary to dwell upon the various re-productive plant-organs. A few brief statements to put you in remembrance of these will be sufficient on this occasion.

You know then that in the blossoms of a large proportion of plants there are, in the centre of each blossom, first, at the base, the *carpels*, and upon them the *styles* surmounted by the *stigmas*—these are the female organs. Around them are, secondly, the *stamens* or male organs each consisting of a filament bearing an anther containing pollen-grains. When these grains are ripe the anther bursts, and the pollen is scattered by various agencies.

For the fertilization of the blossoms it is necessary that some of the pollen-grains should alight upon the stigmas of the female organs. So alighting they adhere, because of a glutinous exudation from the stigmas; and, in a short time, there descends from each of them a sort of radicle, or very fine tube, which works its way down the style, and through, or between, the integuments, till it enters the micropyle and mingles its juices with those of the ovule. The work of fertilization is then complete, and the ovule produces a seed, which in due time and under favourable circumstances will produce a plant like unto that from which it sprang.

The blossoms of the wild rose, the apple, and the cherry are familiar instances of these bisexual flowers.

In many other kinds of plants there are both male and female blossoms—*staminate* blossoms and *carpellate* blossoms—growing on the same plant. Call to mind a field of Indian corn (*Zea mays*), well planted, well cultivated, and in full bloom. Such a field is a sight to gladden the owner's heart, and to excite the admiration of every thoughtful beholder. The tall plants tower over head, each surmounted by the graceful panicle of male blossoms, the anthers of which dangle like bells from the sloping roof of a Chinese pagoda, and scatter the dust of pollen at every puff of air or other disturbance. Beow bursting from their leafy wrappers are the stigmas of the carpellary blossoms spreadin

like tassels of pale green silk to catch the pollen that descends. No bees meddle with these anemophilous blossoms ; and it will be observed that they possess none of those things which attract insects, viz., bright colours, nectar and perfume.

Usually the seeds of pumpkin (*Cucurbita pepo*) are sown here and there among the corn, and the plants from them trail far upon the ground. The flowers of the pumpkin also are of two kinds, male and female, growing upon the same plant ; but it is evident from the nature and position of the plants that the wind cannot effect pollination in their case : the agency of insects is necessary ; and the blossoms are large and showy, and well designed to attract the bee.

Again in numerous instances the male blossoms grow upon one plant, and the females upon another of the same kind. Every grower of hops knows that for successful cultivation he must have male plants intermingled with the female. The proportion is, if I remember rightly, one in ten, or one in twelve.

The willow and the poplar are familiar examples of plants of the kind we are speaking of. Who has not rejoiced to see, in the early spring, the golden catkins of the male willows, for they are tokens that "the summer is now nigh at hand?"

The country people in the south of England call the flower-laden branches of the willow "palms," for the blossoms come about Palm Sunday ; and in olden times branches laden with them were carried to the churches, to represent the palms carried before our Lord on his triumphal entry into Jerusalem. In this word *palms* so applied we have a local popular name that would puzzle any to whom the circumstances of its application were unknown. And, with reference to this, if I may digress for a moment, I wish to point out that Mrs. William Starr Dana in that bright and useful little work entitled "How to know the Wild Flowers" has made a curious mistake for want of a little old-country "folk-lore." On page 124 she takes pains to shew that the word Marigold comes from "the Anglo-Saxon *mere* a marsh" and that the whole name may signify *marsh-gold*. Which (she says) "would be an appropriate and poetic title for this shining flower of the marshes," (p. 124). But Marigold simply means Mary-gold—the flowers of *Caltha palustris* having been used by our forefathers to garnish the churches on Lady Day (March 25th), just as the Pasque Flower was used at Easter, and the Michaelmas Daisy on the Feast of St. Michael and All Angels (Sept. 29th).

"The Michaelmas Daisie among dede weeds,
Blooms for St. Michael's valorous deeds,
And seems the last of flowers that stood
Till the feste of St. Simon and St. Jude"—

says an Old English Kalendar. But to return—

The willow-blossoms are pollinated by means of insects. Small bees of the genera *Andrena*, *Osmia*, etc., as well as the honey-bee, frequent them in the day time, to obtain bee-bread for their young and nectar for their own delectation ; and in the dusk of the evening hibernated noctuids resort to them for refreshment.

It is a common thing for European Entomologists to spread a sheet under the willow boughs at night, and then by a sudden jar upon the limbs to bring down a shower of moths. The drowsy insects lie inert whilst the operator with the aid of a lantern selects from them such as he fancies.

All these insects fly from flower to flower and from tree to tree and convey the pollen from the male to the female blossoms.

The poplars also are of two sorts, male and female—the staminate flowers growing on one and the carpellary flowers on the other. But in this case the blossoms are of unattractive colouring. They have no nectaries ; and the pollen is light and dry. The wind is the agent of pollination in this case.

We have glanced then at three kinds of blossoms :—

Perfect—in which stamens and carpels grow in the same flower.

Monœcious—distinct male and female blossoms growing on the individual plant.

Dioecious—one plant producing male blossoms only, and another only females.

We have also noticed two means of pollination—(1) the agency of insects ; (2) the agency of the wind. In some kinds of bisexual blossoms self-pollination takes place, as in the Mallow ; but with these we have not now to do. Our attention is to be given to the insect-pollinated flowers.

Of the importance of cross-pollination—i. e. of fertilization with pollen from other blooms of the same sort, we may judge from the arrangements made in nature to secure it.

(1) First we notice the wonderful abundance of the pollen—sufficient for every requirement. Take your stand by an apiary towards evening, and watch the returning bees. How laden they are with bee-bread—which is compressed pollen—and yet in the course of their operations they have been instrumental in fertilizing thousands of blossoms. Yes, the busy workers have discharged their duties, and have not been stinted in their reward.

(2) We find that the various arrangements of the floral leaves, or perianth, for the shelter and preservation of the pollen are worthy of observation. Take that common flower the Dandelion (*Taraxacum officinale*). This flower is in reality an inflorescence consisting of a hundred or more flowerets packed together. This collection of small blossoms is surrounded by a green involucre—the whole forming a capitulum which closes tight on the approach of rain.

In the Sun-flower (*Helianthus annuus*), the capitulum bends over in wet weather; and the moisture is shed from the roof-shaped receptacle and the sheltering disk flowers.

In many of the lilies, the corolla forms a bell-shaped roof under which the re-productive organs lie in safety; and in the snap-dragon and other flowers of like structure they are shut up as in a cabinet—a cabinet which the bees know how to open.

(3) We learn that the relative positions of the various organs in many instances render self-pollination impossible.

The English Primrose (*Primula vulgaris*) affords us an instance of this. The flowers of the primrose are of two kinds. In one the style rises higher than the stamens, in the other the stamens are placed above the style. In either case the stigmas are at the same height as the anthers in the other. An insect comes to a flower which has a long style; its proboscis at a certain part is charged with pollen from the elevated anthers of a blossom which it has just left. As the insect rifles the long-styled flower of its sweets this pollen is brought in contact with the stigma which is at the right height to receive it. At the same time the proboscis of the insect is acquiring a fresh supply of pollen lower down from the short anthers and this it will convey to the next short-styled primrose blossom that it visits. It is possible that the short-styled flower may be self-pollinated; but it is quite impossible that the long-styled flower can be so.

(4) We see that the ripening at different times of the anthers and stigmas of some kinds of blossoms insures, with the aid of insects, the cross-fertilization of blossoms.

The Monk's hood (*Aconitum napellus*) affords us an example of this. The blue flower of the monk's-hood is really the calyx. Its uppermost sepal forms a sheltering hood in which the two posterior petals are hidden. These petals are of a remarkable shape, curved and clawed, and they secrete nectar which attracts the humble-bees. The monk's-hood is exclusively a humble-bee flower. The other petals are either wanting or are insignificant. In a newly opened monk's-hood flower the numerous stamens protrude and their anthers ripen before the stigmas. A humble-bee alights in the middle of the flower, holding on by the side sepals. In its struggles to reach the nectaries, the under part of its body is brought in contact with the anthers and becomes charged with pollen.

In the older blossoms of the monk's-hood the stamens all bend back out of the way, and the carpels are protruded. A bee alighting on such a blossom brings pollen to the stigmas now ready to receive it and the blossom is fertilized.

Another noteworthy instance of a plant which ripens its anthers and stigmas at different times is afforded by the Foxglove (*Digitalis purpurea*). The foxglove like the monk's-hood is a humble-bee flower. Indeed its form and size seem especially adapted for the reception of the humble-bee. The stamens and pistil are extended along the upper part of its inner surface. A humble-bee backing out, after sucking the nectar from the further recesses of the flower, scrapes off, by means of its bristly coat, the pollen from the anthers, and carries it on its back to other foxglove blossoms whose stigmas are ready to receive it.

The result of cross-fertilization seems to be the production of more numerous and finer seed, and eventually of stronger and more beautiful plants.

Some flowers have a wide circle of insect attendants. The Buttercup is known to be visited by more than sixty different kinds of insects (Percy Groom's *Elementary Botany*, page 121). Others are exclusive, permitting only the visits of a favoured few.

We have seen that the willow catkins are pollinated by bees and noctuids. The flowers of the Blueberry (*Vaccinium Canadense*) are fertilized by wasps which resort to them in great numbers. The round head and short lingula of the wasp fit well into the shallow saucer-like blossom.

Another plant that is visited by wasps is the Kalmia (*Kalmia angustifolia*). This also has shallow blossoms which have this peculiarity, each stamen is sunk in a groove the shoulder of which confines the anther. When an insect in search of nectar butts against the centre of the flower the stamens with their anthers are set free and start forward, scattering pollen on the front of the intruder. This pollen is carried by the insect to other blossoms of the sort and fertilizes them.

In early summer the Lilac blooms are visited by long-tongued moths, such as *Amphion nesus* Cram., *Hemaris thysbe* Fabr., etc., which fly in the daytime. In the dusk of the evening the white-blossomed perennial Phlox invites the larger hawk-moths, *Sphinx chersis* Hubn., *S. Kalmie* A. & S., *Deilephila chamænerii* Har., etc. The flowers of the Dogbane (*Apocynum androsaemifolium*) are favourites of moths of the genera *Plusia* and *Thyatira*.

Of the butterflies *Argynnis myrina* Cram. has a partiality for Golden Rod (*Solidago Canadensis*); *Pyrameis cardui* L. for Red Olover (*Trifolium pratense*); *Satyrus alope* Fabr. and *S. nephele* Kirby for the blossoms of *Asclepias cornuti*; *Pamphila Manitoba* Scud. for *Solidago lanceolata*, and so on.

In the Society's Annual Report for 1899 I gave the life-history of a small moth *Metzneria lappella* Zel. newly introduced from Europe. It is a burdock insect. Its larvæ feed on the seeds of the plant, and the moth itself feeds from and fertilizes the burdock flowers.

The flower-head of the Burdock (*Lappa major*) contains about forty flowers. They are compressed in a globular involucre, the imbricated scales of which are coriaceous and tipped with awl-shaped hooks. The calyx in each flower is represented by a dense circle of delicate, white, silky and branched hairs surmounting the seed vessel. The corolla consists of a white tube half the length of the blossom, and then of a vase-shaped, purple expansion, five-cleft at the top. The brownish purple anthers are united and form a tube which produces pollen on the inner side. Through this tube when dehiscence occurs the pinkish white style forces its way, carrying with it the delicate, white, pellucid pollen-grains. The style then parts at the top into two branches which bear the stigmas on the upper surface. An insect carrying pollen-grains from other flower-heads intrudes among the flowerets and leaves pollen-grains attached to the stigmas. In its efforts to reach the nectaries of the flower it dislodges pollen from the freshly protruding styles and then bears it away to fertilize other blossoms.

The Evening Primrose (*Oenothera biennis*) is the special plant of *Alaria florida* Gn. The moth fertilizes the blossoms and is sometimes wrapped in the closing petals on the approach of day. Its larvæ feed upon the plant.

The honey-bee fertilizes the white clover and the humble-bee the red. Grant Allen in "Flash Lights of Nature" has drawn attention to the fact that as the flowerets in a head of clover are fertilized they droop over out of the way so that the bees may not be hindered in their work by vain endeavours.

Another flower that is pollinated by bees is the Nasturtium (*Tropæolum majus*). Three of its five showy petals at a certain distance within are set with a protective fringe, a veritable *chevaux-de-frise* to keep out small insects which would rob the flowers of its sweets and accomplish no good purpose. When a bee of sufficient weight enters, it bears down this fringe over the anthers, and at the same time comes in contact with the advanced style, the stigmas of which become charged with pollen which the bee has brought from other nasturtium blooms. The bee passes into the recesses of the flower, to imbibe the nectar accumulated in the spur, and as it does so the fringe and the stamens rise to their normal position. Having exhausted the supply of nectar, the bee backs and turns to make good its escape, and in its efforts to do so is covered with fresh pollen from the anthers of the flower.

The Campanula grown in our gardens (*C. medium*) has an interesting lesson for us.

The long flower-bud, yet unopened, encloses the tall pistil, along which the five filaments with their long anthers are extended. When the anthers dehisce the pollen masses adhere to the style leaving about a quarter of an inch at the top free. This projecting

part contains the five stigmas. As soon as the corolla opens the anthers shrink away from the style and shrivel up, leaving the pollen masses behind them. At the same time the five sections of the style part, and curl up ram's horn fashion.

Now comes the bee as the minister of Hymen. In this case it is *Megachile scorbicularis* Smith. The insect comes with its abdomen thickly coated on the under side with pollen from other blossoms. As it passes into the flower to get to the nectaries below some grains of the pollen with which it is already charged are scraped off by the curled stigmas and adhere to them. The bee secures a further supply of pollen; but as it passes out of the blossom the under surfaces of the parted style take nothing from its fresh burden. Successive visitors completely clear away the pollen from the pistil.

The small pale flowers in the umbels of the Wild Carrot (*Daucus carota*), the Water Hemlock (*Cicuta maculata*), the Cow Parsnip (*Heracleum lanatum*) etc., are resorted to and fertilized by a very host of small flies and ichneumons.

The English Arum (*Arum maculatum*) also is fertilized by flies. The whole process of its pollination is described in that admirable work, Percy Groom's "Elementary Botany," published by Bell & Sons, London—a work which I can strongly recommend. The story is most interesting. The flies, covered with pollen from another arum, are drawn to the newly opened spathe by an ill odour which it gives out. They creep down the inside of the spathe through a palisade of fibres which grows from the floral axis and closes in a lower chamber—a veritable fly-trap. In this chamber around the floral axis grow, at the base, a number of sessile ovaries with sessile stigmas; above them is a zone of sessile anthers. The imprisoned flies fertilize the ovaries with the pollen they have brought in, living the while upon nectar given out by the stigmas. Then the anthers above them ripen, and they become dusted with new pollen. When this is done, the enclosing fibres wither, and the flies escape to be again attracted by unpollinated arums.

The Skunk Cabbage (*Symplocarpus foetidus*) and the Carrion Flower (*Smilax herbacea*) are mal-odorous Canadian plants that are fertilized by the aid of flies. Thoreau compared the smell of the latter to that of "a dead rat in a wall." Happily such plants are few in number and grow in out-of-the-way places, or retain their offensive odors but a short time. They should serve to make us thankful—they tell us what might have been if God had not adapted the earth so favourably to the requirements and tastes of the children of men. In His great goodness He has filled it with beautiful forms and exquisite colours and harmonious voices and rich perfumes.

Asa Gray in his excellent little school-book entitled "How Plants Grow," has given reverent expression to some great truths. On page 96 he says:—

"Such a system" (The Natural System) "is not a mere convenience for ascertaining the name of a plant, but is an illustration, as far as may be, of the plan of the Creator in the vegetable kingdom. And the Botanist sees as much to admire and as plain evidences of design, in the various relations of the plants to each other (i.e. in their resemblances and their differences), as he does in the adaptation of one part of a plant to another, and in the various forms under which any one organ may appear. The different kinds of plants are parts of a great whole, like the members of a body or the pieces of an harmonious but complete edifice or structure; and this whole is the *Vegetable Kingdom*."

Yes! And when the student considers the bearing of the insect tribes upon this Kingdom, he finds yet further evidences of design, he sees yet more to admire, for he obtains a wider view of the plan of the all-wise and beneficent Being whose hand hath made all these things.

"The great Creator condescends to write
In beams of inextinguishable light
His names of wisdom, goodness, power and love,
On all that blooms below, or shines above;
To catch the wandering notice of mankind
And teach the world if not perversely blind
His gracious attributes, and prove the share
His offspring hold in His paternal care."

COWPER, "Hope."

The Rev. Dr. Bethune moved a vote of thanks to the President for his valuable and interesting address which had afforded much pleasure and instruction to all present. Mr. Dearness, in seconding the motion, drew attention to the fact that the beautiful diagrams

exhibited in illustration of the address were drawn by Dr. Fyles himself, who thus shewed that he was no mean artist, as well as an eminent entomologist and botanist. He then spoke of the method of fertilization of nasturtiums, and said that he had formed a different theory from that put forth by the President, and would now look forward to further investigations of the case. Mr. Bowman heartily supported the motion, and took occasion to speak of the danger many people incurred from the ignorance of the distinctive characteristics of poisonous fungi, mentioning the case of one that he had gathered this autumn, the immature specimens of which were destitute of the disagreeable odour belonging to the plant.

A PLEA FOR THE SYSTEMATIC AND ECONOMIC STUDY OF THE FOREST INSECTS OF ONTARIO.

By PROF. W. LOCHHEAD, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

Ontario has an immense area of forest lands composed of hemlock, spruce, tamarac, balsam and pine. According to a recent report of the Forestry division of Ontario, "Of the 142 millions of acres comprising the province, about 120 millions of acres are still owned by the crown. Out of this, nearly 22,000 square miles, or 14 million acres are under license to lumbermen." The Government has very wisely done much to preserve these valuable domains from destruction by fire, by the appointment of a large number of rangers, who patrol, as it were, the forests and put out fires which may have been carelessly started by Indians, campers, or settlers.

There is, however, a danger, perhaps as serious as that of fire, against which no precaution has been taken. I refer to the danger of insect depredations.

Ontario is falling behind many of the neighboring States of the Union with respect to the great problem of the relation of insect work to our forest domains. Much work is being done by the Federal Government at Washington, and by many of the States where extensive forests exist, in determining the conditions which increase or decrease the extent of insect ravages. Already extensive experiments have been carried out, and much valuable information has been secured. The investigations have found that the amount of damage caused by insects in the large forests is enormous; and to prove that their results are worthy of consideration the very persons who are most directly interested in the preservation of the forest timber, the great lumber and timber companies, have readily come forward and assisted the investigator by affording every facility in the forest for a thorough study, and by money contributions as well.

In Europe every trained forester is well informed with regard to forest insects and knows how to combat their attacks; but in Ontario we are content to go along in our ignorance and pay no heed to insects or their ravages, probably because our forest areas are so large.

The questions will naturally be asked: "In what way can a study of forest insects help us in the preservation of our forests?" and "How can assistance be rendered in cases of serious insect ravages?"

In answer to the first question it may be said that a knowledge of the life histories of injurious forest insects is just as essential to a proper, intelligent campaign of operations as is a knowledge of life histories in our work against the foes of the orchard and garden. Systematic work must precede intelligent economic work; we must distinguish the economic forms from the beneficial or harmless species. In many cases it may be possible to utilize the beneficial forms as allies against the injurious forms, and in a well developed plan of operations the beneficial insects should be preserved from destruction.

I maintain, then, that a systematic collection of forest insects should be made so that we may become familiar with the forms; that a series of observations be made so that the life-histories of as many as possible be obtained for our guidance in combatting the injurious forms.

In answer to the second question proposed it may be said that hopeful results have been secured for American conditions of forestry which are so very different from those obtaining in Europe. In Europe the forests are carefully guarded, and a semi-military system of protection is in vogue in most of the continental countries.

In West Virginia it has been found that there is a proper time to fell trees to prevent damage by insects. Dr. Hopkins cut different kinds of trees twice a month year after year, and he got definite results for the oak and hickory for example. The timber cut in the winter months was gradually converted into a powder, while that cut during the summer remained almost intact. These results are confirmed in the practical operations in the forests, for it has been observed that certain species of trees felled in late fall, winter, or early spring suffer more damage than those felled in July and August.

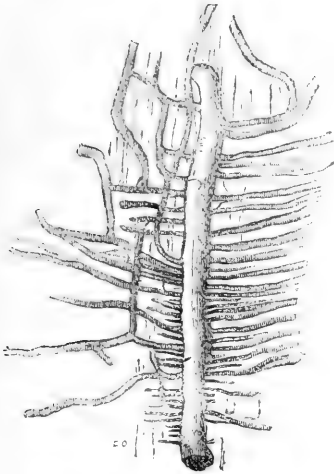


FIG. 1. *Hylurgus piniperda*.

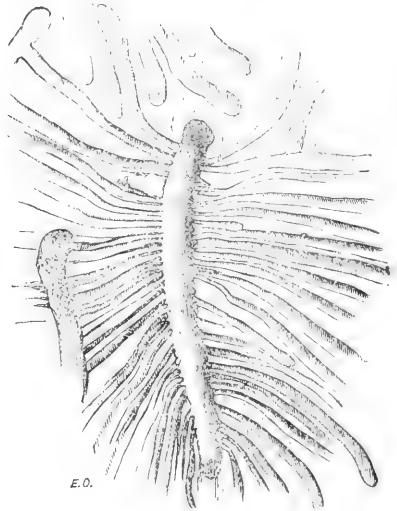


FIG. 2. *Hylesinus fraxini*.

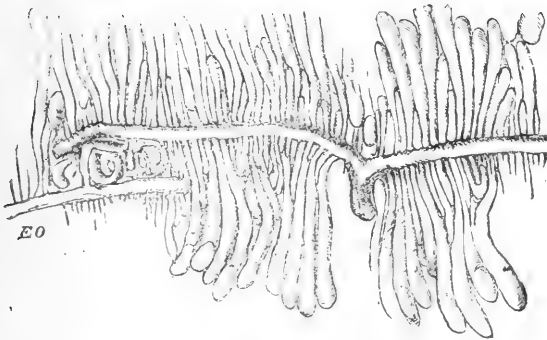


FIG. 3. *Scolytus destructor*. The beetle, magnified, and its burrows.
(See page 72.)



dead trees are the most likely ones to suffer from insect attacks. Thus careless methods of handling timber whereby standing trees are girdled, branches broken and otherwise dismembered and disfigured, are very fruitful sources of insect distribution to those areas. These infested areas become centres of infestation to the surrounding forest.

In Ontario where lumbering operations are carried on in many isolated limits the danger is extremely great. The trees along the margin of the felled areas are very liable to lose their vitality on account of their inability to adapt themselves to the changed conditions which have arisen. If the lumbering operations are postponed for any length of time there is a great likelihood that the insects will spread from the felled areas to the unbroken forest, but where lumbering is carried on continuously in an area the insects find sufficient new-felled timber and branches without betaking themselves to the unbroken forest.

The plan of forest-ranging for the prevention of fires is undoubtedly of tremendous value in the prevention of the spread of forest insects, but there is another work for the ranger. He could, if he knew more about insect conditions and habits, arrange for the

burning of certain felled areas at a time which would be the most favorable for the destruction of the insects which are preying upon the dead and dying trees. Such burnings, however, should be very carefully controlled so as not to injure the trees of the untouched forest, lest new feeding grounds be opened up for the insects.

Indirectly, again, the control of forest insects is of much importance. Dr. Hopkins, after a trip through the great north-west timber lands of Washington, Oregon and Idaho, states that his observations prove conclusively that forest fires originate, in very many cases, in timber areas which have been killed by insect depredators. The dead trunks and broken branches furnish suitable conditions for the rise and spread of fires.

The entrance of trunk and bark beetles into the trunk and bark of trees allows access to many timber fungi which penetrate the tissues, sap the vitality of the trees, and eventually kill them. The accompanying figures, 1, 2 and 3, illustrate the manner in which some common timber beetles burrow along the wood beneath the bark. Recent studies by European and American mycologists show very clearly how very prevalent, as well as harmful, fungous diseases are in the forests. It is quite true that insects often attack healthy trees, and fungi gain entrance to trees which have not been attacked by insects, yet the fact remains that the presence of insect pests increases very much the harmful effects of fungi.

In answer, then, to the second question asked regarding the assistance which a knowledge of insect conditions can give towards the control of forest insects, it may be said in summary that much can be done (1) by cutting and felling timber at the most advantageous season; (2) making traps for insects by girdling and felling trees to which the insects are attracted in preference to sound trees, then by careful burning of these traps; (3) preventing the cutting of timber in many parts of a limit, as these parts serve as centres of infestation; (4) preventing careless methods of handling the unfelled trees so as not to injure them and thus to expose them to insect attacks; (5) preventing fires which we know destroy many trees and render them subject to insect attacks; and (6) introducing insects which prey upon injurious forms.

We are not in a position at the present time to carry out all of these methods, for we are ignorant of the life-histories and habits of the majority of the forest insects. Accordingly, I make a plea for the better studies of insects, and such can be best accomplished by a biological survey of the great timber areas of the Province. Such a survey must naturally be undertaken by the Government, assisted, if possible, by the holders of timber limits from the Crown. It is the duty of this Society to call the attention of the Government to the necessity for such a survey.

Professor Packard states in his valuable report on the Forest Insects, published in 1890, that "the number of insects which attack the different kinds of trees in the United States is sufficiently large to excite great fears for the future prosperity of our diminished forests, unless the Government interposes, and through the proper channels fosters entomological research in this direction. Our forests, moreover, are much richer in species of trees than those of Europe. We have, without doubt, on the trees corresponding to those of Europe as many destructive species as in Europe. But we have many more shade trees and forest trees of importance in the Eastern United States alone, and when we add to these the forest trees of the western Rocky mountain plateau and of the Pacific coast, and when we look forward to the attention which must be given in the immediate future to the planting of shade and forest trees on the great plains and in California, the subject of forest entomology assumes still more importance."

According to Kaltenbach the number of injurious insects which attack the forest trees of Central Europe is as follows:

Oak	537 species
Elm	107 "
Poplars	264 "
Willows	396 "
Birches	270 "
Conifers	299 "
Beech	154 "
Alder	119 "

It is apparent that neither the officials of the Department of Crown Lands of Ontario nor the members of the Royal Commission on Forestry Protection in Ontario consider

that insects do any injury to the forests, for in the report issued a few months ago, the insect problem is not even mentioned. Such an omission must be an oversight, due, no doubt, to the fact that none of the members of the Commission are entomologists. It would, indeed, be strange if our Ontario forest domains of such great extent form an exception to the general rule, and harbor no insects.

Dr. Fyles remarked that this paper dealt with a very important subject which deserves the serious consideration of the community. He then referred to the large areas in the Province of Quebec which had formerly been covered with forests of tamarac, but now were desolated by the ravages of the Larch Saw Fly and the timber rendered worthless.

Dr. Fletcher stated that the lumbermen usually say that in the Ottawa valley alone insects cause them a loss of a million dollars annually. This amount is merely an estimate, but it serves to show that they are aware of the losses caused by insects and realize how costly their ravages are. It is found that if the logs cut in the winter are not got into water, they will surely be attacked by insects and badly injured during the summer. A plan adopted in many cases is to turn the logs over from time to time during the summer so as to change the position of the portions exposed to light and those in contact with the soil; another method is to split the bark so that the inner part dries up and prevents the insect larvæ from living in it. These operations, however, are difficult to carry out, as the lumbermen cannot stand the flies which attack them in myriads during warm weather; this cause also prevents them from cutting timber in summer, which has been proved to be a better time than winter as far as the quality of the timber itself is concerned. The attacks of insects are always made upon dead or dying trees and such may usually be found on the edges of clearings where partially injured trees have not been cut down. In 1884 there was a great forest fire in the Ottawa valley, which left an immense number of burnt trees still standing. These were immediately attacked by insects and the loss would have been complete had not the owners of the timber limits at once set to work to cut and remove as much as possible of what was left. Any tree that is scorched with fire or partially burnt is sure to be attacked by wood-borers during the following summer.

Dr. Fletcher closed his remarks by moving a vote of thanks to Prof. Lochhead for his interesting paper; this was seconded by Mr. Dearness, and carried unanimously.

RESULTS OF SOME EXPERIMENTS IN PROTECTING APPLES FROM THE ATTACKS OF THE SECOND BROOD OF CODLIN MOTH.

By F. M. WEBSTER, WOOSTER, O.

In Ohio, our attempts to protect the apple crop from attack by the codlin moth have given us varying results. Some years, spraying with the arsenites like Paris green, London purple and arsenite of soda have given excellent protection, and the apples have been very free of larvæ. Other years, though the spraying has been done with equal care and in proper season, the effect has been discouraging, to say the least. The causes for these varying results are not at all clear and there are some grounds, during some years, for the question as to whether, or not, it pays the orchardist to go to the expense of two or three sprayings and get so little in return for his labor, and other necessary expenditures, which spraying necessitates. Frequently the apples will pass through the season, up to late August, without exhibiting indications of the work of the apple worm, but after that the fruit seems to be seriously attacked and much damage done. There are with us, two periods of dropping of the wormy fruit. The first in late July and the fore part of August and the second setting early in September. Orchardists have declared that they could prevent the first, very largely by spraying, but the second baffles them. I have suspected, for a long time, that this was due to the attack of the second brood, and those who succeeded in protecting their fruit early in the season were, very largely, suffering from the results of moths developing in unsprayed orchards, and migrating during August to those that had been carefully and properly sprayed, thus infesting these after it is possible to protect them by the usual measures. In order to

test the probable efficiency of spraying, during the ordinary season for doing this, an experiment was tried in the orchard of Mr. William Miller, at Gypsum, Ottawa County, along the southern shore of Lake Erie. It was obviously impossible to get two trees exactly alike, and not easy to secure two greatly alike in close proximity to each other, but we selected two well in from the outer margins, and one of these we covered with netting, such as is used for covering baskets of peaches and grapes. The trees were sprayed for the last time on June 22nd and the covering applied the next day.

All fallen apples were removed from under both trees on August 29th, while there was a cessation in dropping of infested fruit, and, as we thought, all or nearly all of the

first brood were thus eliminated. On September 14th, soon after the terrible wind that swept over the lake region, the spent tropical hurricane that devastated Galveston, Texas, there were removed from under the covered tree 229 apples, 59 per cent. of these being sound, their weight being 77 pounds. Under the uncovered tree there were 1,052 apples, only 10 per cent. of which were sound, and their weight was 214 pounds.

October 22nd, there were picked from the covered tree 107 pounds of fruit; 372 apples were sound and eight wormy. Windfalls, 18, all wormy. From the check tree there were picked 128 pounds of fruit, 253 apples being sound, and 41 wormy. Of the windfalls, 94 were sound and 104 wormy. (Fig. 4 illustrates the familiar appearance of a "wormy" apple.)

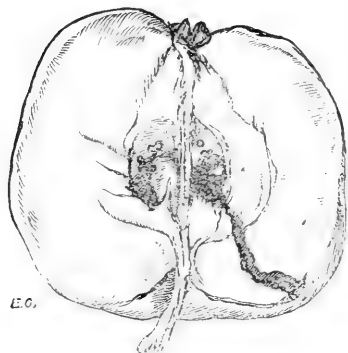


FIG. 4.

Recapitulating, the covered tree, after the fruit was removed from beneath on August 29th, carried 627 apples. Of these, 372 were gathered in a sound condition and 26 were wormy. The uncovered tree, after fallen fruit was removed on August 29th, carried 1,544 apples, of which 347 were sound when gathered and 145 were wormy. The summary would read thus: Covered tree, out of 627 apples, gave 466 sound and 161 wormy; the uncovered tree, out of 1,544 apples, gave 452 sound and 1,092 wormy. This, I think, shows pretty clearly what the result would be if we could manage the second brood of moths, and also who is to blame for the disastrous effects of the second in well sprayed orchards.

There are two other points worth mentioning. First, where a species is double brooded, the second brood is likely to be the most migratory in habits. Second, it is the outer rows in a well sprayed apple orchard that are most affected late in the season. Taking it altogether, the trouble does not appear to be with the spraying, but with those who do not spray at all, and who furnish the migrating female codlin moths that give origin to the second generation of worms in a well sprayed orchard.

In the discussion that followed the reading of the paper, Dr. Fletcher stated that he had that day seen a young larva about a week old, which evidently belonged to a third brood. It seemed clear that the best method of counteracting this insect was to spray for the first brood and bandage the trees for the second.

Mr. Bowman asked whether a late hatching of a third brood would not be a good thing, as then they would probably all be winter killed. Prof. Webster replied in the affirmative, and said that some years ago there was a severe frost in June, which nipped the leaves of the trees. *Clisiocampa* caterpillars had been very abundant, but they all perished from frost or want of food, and it was years before they became numerous again.

Dr. Fletcher mentioned that he had received some cocoons of the Tussock moth from Toronto, covered with eggs. They all hatched out recently under cover, shewing how near this species is to being double-brooded.

The next paper read was by Mr. Arthur Gibson, Assistant Entomologist of the Experimental Farm at Ottawa, on the "Life-history of *Arctia Phalerata*," in which he described in detail all the stages in the life of this insect from the egg, through the caterpillar and pupa to the perfect insect. As it was of a highly technical character, the paper has been published in *The Canadian Entomologist*. (Vol. XXXII, p. 369.)

Dr. Fletcher, at the close, remarked that such a paper as this indicated the lines upon which the best work should be done. It had been prepared with the utmost care and minute observations had been made at every stage of the insect's life. It was very important that life histories should be worked up in this way, as the imagoes alone are not to be depended upon in the separation of species. Very little is known about some of the commonest insects, and regarding others further details are required to fill up the blanks in our knowledge. Every Entomologist should try to rear at least one species every year, and then a very great deal would be accomplished in the course of a comparatively short time. He then spoke of the mode of describing a larva, and explained Dr. Dyar's plan of numbering the tubercles and thus simplifying very much the work of description.

NOTES ON INSECTS OF THE YEAR 1900.

DIVISION No. 2.—BAY OF QUINTE DISTRICT.—By J. D. EVANS, TRENTON, ONT.

During the past season the Forest Tent Caterpillar (*Clisiocampa disstria*) has done much damage in certain districts but not to such an extent as last season.

Grasshoppers caused some destruction to grain and pasture in some localities in the northern portion of the County, but only over comparatively small areas.

The pea weevil (*Bruchus pisi*) has come to be such a pest throughout Prince Edward County, that the seedsmen are looking for other and more suitable localities, in one case having transferred their operations in part to Lindsay.

The larvæ of *Phytonomus punctatus* were observed to be quite numerous in a clover field at Lake on the Mountains, near Glenora, Prince Edward County, on the 24th of May last. In very many cases the larvæ were curled up and encircled the tip end of the blades of grass, and apparently in a dying condition from either being parasitized or from some disease. At the same time and in the same clover field a number of examples were taken of *Hylesinus trifolii*, Muell. also eleven specimens of *Phytonomus nigrirostris*, Fab.

In July last unusual visitors appeared in a pear orchard owned by Mr. W. A. Warner and situated about 2 or 3 miles to the north-west of the town of Trenton. This orchard was about one acre in extent, in the midst of an extensive apple orchard, and had a few plum trees interspersed through it. About the third week of the month all the pear trees had their lower limbs swarming with small green caterpillars, there was no web nor did they suspend themselves by a thread, but seemingly dropped to the ground when satiated or when the tree was struck, then crawled towards and up the trunks again to the higher branches. The trunks of the trees and the ground, in places, were fairly green with the crawling masses of them. The caterpillars were from $\frac{1}{2}$ to $\frac{3}{4}$ of an inch long when first noticed, of a dark green colour at one end and a lighter green at the other. The apple trees in the immediate vicinity had a few of the caterpillars but the plum trees were not visited by them. A thorough spraying destroyed them all. It was not until about two months thereafter that the writer became aware of their visit through a letter from Dr. Fletcher. The above particulars having been procured from Mr. Warner at such a long interim from their appearance, further information could not be elicited.

There has been a great scarcity of moths during the past season as compared with last, very few coming to light and they only of the commonest species.

DIVISION No. 3.—TORONTO DISTRICT.—By D. G. COX, TORONTO.

Owing to other duties the writer has had very limited opportunities for observing the insect ravages of this district during the past season.

The Tussock Moth (*Orgyia leucostigma*) is still with us and has caused considerable damage to the foliage of the horse chestnuts in some localities. The civic authorities did considerable spraying of the foliage in the early part of the season which no doubt destroyed the young larvæ in large numbers. The pest appears to be diminishing and if they keep on fighting it, they will eventually succeed in getting it under control.

The Tent caterpillar (*Clisiocampa Americana*) was in considerable numbers on the wild cherry trees around the suburbs of Toronto, and many orchards were rendered unsightly by the tents. The Cabbage Butterfly (*Pieris rapae*) has been unusually numer-

ous this year in this locality, and the cabbage and cauliflower crop in many gardens has consequently been considerably damaged by the larvæ of this common pest. The cabbages were so badly perforated by the caterpillar as to render them unmarketable. I observed also in gardens where no cabbages were grown, that the turnips and radishes were severely attacked by this larva.

During a trip taken through Scarborough and Markham townships in the latter part of July, I visited several farms and found considerable damage had been done to the turnip crop by what appeared to be the larvæ of (*Noctua C-nigrum*). In some fields 40 per cent. of the crop had been cut off and the farmers were re-sowing seed in the bare places along the rows that had been destroyed. I did not know the best remedy to recommend to prevent the ravages of this cut worm, but advised them to apply to Dr. J. Fletcher, the Dominion Entomologist at Ottawa, who would give them valuable information which would be of great benefit to them in combating the ravages of the insect.

Around one of the farms I visited there were planted about two-thirds of a mile of European Mountain Ash trees (*Pyrus acuparia*). These trees were about fifteen years old and were so badly infested with the larvæ of the Flat-Headed Apple Tree Borer (*Chrysobothris femorata*) that the writer picked from the outer bark of one tree ten young larvæ about five-eighths of an inch long, several other trees were examined in the row and found to be in the same condition. Quite a number of the trees had already been killed by this pest. I advised our friend the farmer to pick out as many of the larvæ as he could during the months of July and August, after that they would have penetrated into the heart of the tree and consequently could not then be reached. I also told him to paint the trees next spring with a thick solution of soft soap and washing soda before the beetle oviposits so that the young larvæ will have difficulty in penetrating the bark. The ravages of this beetle seem to be confined more particularly to the trunk of the tree; from the ground up to the first branch. I found no evidence of larvæ above the first branch in any case.

The Spruce Gall-louse (*Chermes abietis*) does not appear to be so abundant in this locality as formerly.

DIVISION No. 4.—HAMILTON DISTRICT—By JAMES JOHNSTON, BARTONVILLE.

Want of time during the past season has prevented me from doing but very little insect collecting so that my brief report is mostly made up from my observations on the farm during my daily occupations.

During May and most of June cut worms were very troublesome, being more numerous than I have ever known them to have been. *Systema blanda*, Mels (the pale-striped Flea-beetle) has been quite numerous. Eight years ago when I first noticed these little beetles, they seemed to confine themselves almost entirely to rag-weed, but each year since then they appear to be taking to other plants as food, and now they may be considered destructive to turnips, pumpkins and strawberries. Last season a few choice pumpkin seeds were planted and in the course of a short time when I went to see how they were doing I found the plants thickly covered with these beetles making them appear as if sprinkled with ashes, and, on my approaching, they all vanished, being very quick.

July 22nd, *Oriocercis 12 punctatus*, Lin. made its first appearance in our asparagus patch when I took seven specimens. As the season advanced they increased in number so that I fear by next season it will be reckoned amongst our already too numerous garden enemies.

Aug. 17th, *Colias eurytheme*, Bd. In crossing the clover meadow where *C. philodice* was very numerous I noticed this orange-colored beauty which I secured with my sun-hat after a hard chase. It is a beautiful large specimen which is of double interest to me as it is the first of the species I have taken, and differs from those in my cabinet by having the front half of the fore wings a pale yellow.

Aug. 30th, *Nonagria-subflava*, Gr. This is the third specimen of what is, as far as I can learn, a rare insect during my years of collecting. I took it in the house having been attracted by the light in the kitchen.

Aug. 31st, *Catocala nebulosa*, Guen (1 spec.) and *C. Robinsonii*, Gr. (2 spec.).

These two species I consider an interesting capture as both species are new to my collection and possibly to Canada as I have never heard of them as being Canadian species.

This I should say has been a year favorable for this very interesting genus as they have been unusually abundant in this locality. I missed all the early kinds as I was unable to look after them before Aug. 18th, but after that succeeded in taking seventeen species, amongst them four *C. desperata*, Guen., of which I never took but one, and it several years ago, and a doubtful specimen, possibly a variety of *C. paleogama*.

In the early part of the season I noticed that some insects were doing much damage amongst the strawberry plants by eating the heart leaves while young and tender and I was at a loss for some time to discover what they were, but finally I detected a black beetle doing the mischief, and by keeping watch I saw several doing the same thing so I have made up my mind that they are the mischief makers. They straddle the leaf and very soon destroy it as they eat quite greedily.

DIVISION 5.—LONDON DISTRICT.—BY R. W. RENNIE, LONDON.

That most exasperating of all injurious insects, at least to the average gardener, made its appearance last spring in unusually large numbers, viz., the CUT WORM, mostly the larvæ of *Hadena arctica*. There seems to be a considerable amount of uncertainty in regard to the appearance and disappearance of this insect.

In 1895 the moths were flying in immense numbers. The following spring the larvæ did great damage, but when the time arrived for the appearance of the moths, those of us who were expecting a great number, were disappointed, as very few appeared.

Again this year, the larvæ were exceedingly plentiful, but the mature insect, at the time it should have appeared, was in very small numbers. I have not seen any explanation offered for this heavy mortality amongst the pupæ. Remedies proposed:—Placing bunches of grass, clover, etc., saturated with Paris green along the rows. This is of very little use, the young larvæ are not such fools as to eat withered foliage, when they can get the fresh article right at hand. But a mixture of bran and Paris green seems to be very much to their taste, while not neglecting the plants altogether for the bran mixture, they are more inclined to try it than anything that has been proposed up to the present.

CABBAGE ROOT MAGGOT.—This insect has been quite destructive this year, the only remedy so far that has been beneficial has been to wrap the stems of the plants when transplanting with tar paper. In the August number of the "Canadian Horticulturist" there is a suggestion from one of the staff of the Guelph Agricultural College, namely, to try a tablespoonful of carbon bisulphide in a hole at the base of the young transplanted plant. This may prevent the mature insect from depositing her eggs on the plant, but, with carbon bisulphide at twenty cents per pound, and cabbages at twenty cents per dozen, I think that the gardener had better quit growing cabbages. The cost for carbon alone will be about ten cents per dozen plants. The recommendation of such a dangerous insect destroyer as carbon bisulphide I think should be condemned; it may answer very well for laboratory experiments, but in the hands of the general public, may be the cause of numerous accidents, which will result in all probability in a general distrust by the public of trying any new insecticide with the chemicals of which they may be unfamiliar.

RED SPIDERS.—This mite has been very destructive this year to growers of sweet peas. It has got to be such a pest that most lovers of this flower in this section will be forced to abandon their cultivation. Last season, although a grand season for the pea family here, was very short, ending about the middle of August, due almost entirely to the ravages of the red spider.

Cold water spraying is not sufficient to keep them under control. To apply an emulsion you will have to have a pump capable of delivering the emulsion at at least thirty-five pounds pressure.

ROOT APHIS.—This pest appeared in quite large numbers this year attacking sweet peas and asters. I have seen no preventative proposed. Aphides were very numerous this season. I have seen whole fields of cabbages almost entirely covered with them. Spray with kerosene emulsion, or if you have a water pressure of sixty or seventy pounds use water only.

NOTES ON THE SEASON OF 1900.

BY J. ALSTON MOFFAT, LONDON.

Ravages by cut worms were reported to me from far and near as being unusually severe. And several kinds of moths presented themselves to my notice in conspicuous profusion later on, as probably coming from such worms; such as *Agrotis C. nigrum*, *Mamestra devastatrix*, *Hadena arctica* and several others in lesser numbers, whilst toward the end of the season *Agrotis subgothica* (Fig. 5) was in great abundance.

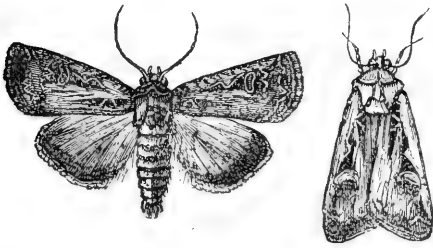


FIG. 5.

A most unusual outbreak of *Crambus excisus* made itself manifest in the early part of June, and lasted well into July. Early on Sunday morning, June 10th, I was walking down the delightfully quiet street, when my attention was attracted by the singular appearance of the pavement in front of me. I thought it was covered with peanut shells, broken up very fine, and fancied some boys had been having a feast on the previous evening, but on reaching the spot I found the strange appearance to be produced by the wings of that moth. I looked up, and there was a restaurant lamp overhead, and the light from it had dazzled the moths and brought them down, when they got trodden underfoot by the travel of the previous evening, until the stone pavement, for a space of eight feet in diameter, was literally put out of sight with their remains. How many deep I could not say. If this was but one of many such "slaughter pits," which it is reasonable to believe was the case, then how little conception one can form of the multitudes of them that were destroyed in one night; whilst it made no perceptible reduction to the numbers left in the fields or at the lights. Then to think of the injury done to crops—grasses mostly—during the feeding up of the larvæ for the production of such swarms of moths, whilst the cause of such injury would be all unseen and unsuspected by those suffering from their depredations.

The notorious "Buffalo Bug," sometimes most misleadingly called "moth," to which it has no resemblance, it being in reality a beetle, *Anthrenus scrophulariæ*, Linn. (Fig. 6 d), has become an established pest in London. Early in the year I took the beetle on the windows of the Y.M.C.A. building; and complaints of its depredations were heard from various parts of the city during the summer. About the first of August two larvæ were brought to me by a lady; one seemed full-fed, the other about half grown. The one pupated about the first of September, and gave forth the beetle in October, the other was still feeding at the end of the month, but died before maturing. The larval stage is the only form of its existence known to the majority of housekeepers, which is correctly represented at Fig. 6a, greatly enlarged, the line at the side indicating the natural size, and they would hardly believe that the beetle at d was the same insect, or one from which they had anything to fear. The beetles are black, ornamented with white and red, but are extremely variable; so much so that three forms have received distinguishing names. It is a European insect, but there it is spoken of as a "Flower Beetle," although known to enter houses and destroy "furs, clothes, animal collections, and even leather and dried plants." It was on this continent that it first obtained its notoriety as a carpet pest, the habit here of tacking down carpets for a year giving it a splendid opportunity to propagate undisturbed; with this, as with others of its kind, frequent

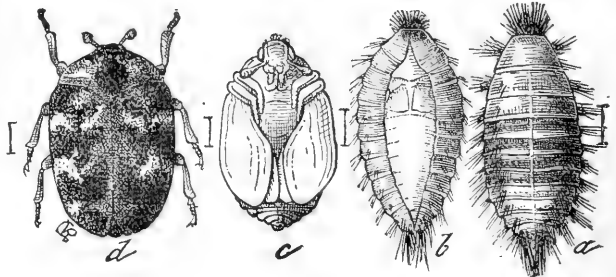


FIG. 6.

stirring up is an excellent means of deterring them from indulging their destructive propensities. And now that it is here to stay, as it is not entirely depending on indoor propagation, so cannot be exterminated except locally, there is nothing for it but to give it due attention ; and to combat it successfully, a knowledge of its nature and habits must be acquired.

Having learned to recognize the beetles, they may be seen upon the windows in early spring and destroyed before they have an opportunity to deposit their eggs, and thus prevent future trouble from them. In nature it takes a full year to complete the round of its existence, but with the artificial warmth of houses it matures in shorter time, and beetles may be found on windows before the end of winter.

When once a dwelling has become infested, not only should the carpets be thoroughly beaten, and disinfected, but narrow strips of thin muslin should be fastened over the joints of the floors with varnish before relaying, so as to prevent them secreting themselves there. A strip of tar paper laid under the outer edge of the carpet is an excellent preventative.

When they are known to be at work and it is not convenient to lift the carpet, benzine will kill any living insect that it is brought in contact with, but great care must be exercised in not allowing a light to approach it while it is evaporating, as it is very inflammable. A damp cloth and hot iron will also effectually arrest the operations of any depredators upon whom they are applied. Steam or benzine may also be used to advantage to get rid of their presence in upholstered furniture ; by such means can their operations be restrained and rendered comparatively harmless. But constant watchfulness against their presence is required, for even if a dwelling has been freed from their presence during one season, the beetles may enter at the open windows the next summer and start a colony afresh.

There is another beetle with similar habits belonging to the Dermestidæ, *Attagenus piceus*, Oliv., whose larva is about the same size and hairy character as that of *Anthrenus scrophulariæ*, which it closely resembles and might easily be mistaken for, as they are sometimes found associated ; but the beetles are quite different in appearance, *Attagenus piceus* being much longer than wide, a flatter insect and entirely black. This also will have to be guarded against, as it is just as destructive a carpet pest as the other, and in some instances becomes the most numerous of the two. For some time past it has been more troublesome in the Society's collection than *Anthrenus varius*, which is supposed to be the standard museum pest.

A friend in the country, in one of his recent letters to me, conveyed the following item of information, which may serve as a warning against the employment of cheap labour : " We got lots of help to thin our turnips this year. Some big green fellows came along who gave us their assistance and worked for their board ; but they made a bad job of it. After we had thinned some rows they would go round and thin them over again, and they left nothing whatever in some rows, but that may have been because they worked at night and did not see what they were doing."

During the remarkably fine weather we were favored with during October, winged *Aphis* were in great abundance, and made walking on the streets quite unpleasant, especially where there were shade trees. One evening when the setting sun illuminated the hazy atmosphere and the tiny wings reflected the light conspicuously and made each individual stand out distinctly, I made an effort to estimate how thick they were. By stopping at different points and watching closely, I estimated there was one to every four inches of space. Before they had all gone, those mosquito-like merry dancers (*Culiciformis*, Latreille, some of whose larvæ live in water and others feed on fungus,) made their appearance, who from some inherent perversity of their nature, congregate in living columns over the sidewalks, with their densest portion about the level of one's face, which one must either go through or turn off the walk to get round, when one would think that any other portion of the street would serve the purpose just as well. One warm summer's day, I took a seat in a pleasant shade, put my light colored straw hat on my knee, when one of these groups formed over it and commenced a jig close to my face, some of them striking it. I swept them away several times but they always returned and gathered as before. I began to suspect that the hat was the centre of attraction, so I placed it on the seat an arm's length away, when they immediately formed their dancing party over it there and kept it up until I took it to leave. So it would seem as if they liked to have some conspicuous object beneath them to keep the crowd in line.

There was sent to me by Mr. J. Tanton of this city, a most singular looking creature of the class *Myriapoda*, and shortly after another was brought by Mr. C. E. Abbott, both of them supposed to have come in packing, and had attracted their attention as something quite unusual. From information received by me at our annual meeting, it proved to be *Cermatia forceps*, Rafinesque, of the family Scutigera, and the first reported appearance of it in Canada. There is an excellent figure of it in the fourth report of the N. Y. State Entomologist for the year 1887, page 129, and from that article I have gathered the following information: It is properly a southern resident, but has been gradually extending northward, until it has now become well established in most of the eastern States. Its body is when full grown, about an inch in length, with a uniform width of a quarter of an inch, but rather narrower at the hind end. It has fifteen pairs of long legs which terminate in a black, sharp hook. The front pair of legs are about half an inch in length, the others gradually increasing in length to the second last pair, which are about an inch and a quarter, whilst the last pair are an inch and a half or more. It is known to be carnivorous, feeding upon insects, for which it enters and frequents houses, and when seen for the first time, is sure to attract attention by its grotesque attitude and rapid movements, and may even create alarm, but for which there is no cause, as it is extremely timid and anxious to escape. Yet, from its anatomical structure it is suspected that it may be poisonous, but there is no authentic instance recorded of its ever having inflicted injury to a human being. From *Insect Life*, Vol. 3, P. 85, I copy the following: "Mr. Webster spoke of the predaceous habits of *Cermatia* and its preying upon the Croton bug. Mr. Fletcher had observed the insect with Mr. Howard, at Washington. Its mode of capturing the Oroton bug before devouring it was remarkable. It sprang over its prey which was thus engaged between its many curved legs."

The unusually warm weather in October, had the effect of bringing to maturity great numbers of the Tomato Sphinx, and many were captured on the wing. I secured a fine, fresh specimen on a shop front in the principal thoroughfare of the city on the morning of the 19th.

Anosia Archippus was noticeably scarce through the season, as compared with the previous year, and yet Messrs W. E. Saunders and H. Gould saw them on the 19th of September, accumulated in such multitudes on the trees at Point Pelée, as to put the green of the foliage out of sight, whilst the lower branches were drooping with their weight. On the 27th of October, the janitor of the Y. M. C. A., brought me a living specimen which he had taken from a bush, helpless from the coldness of the day; bright and fresh, as if newly hatched. It was very lively in warmth and sunshine, and fed freely, but dormant when the room was cold. On two occasions it remained in the same position from about four o'clock Saturday afternoon, until near noon on the Monday following. On the 13th of November, I allowed it to remain too long on a frosty window, from which it never fairly recovered, and it died on the 16th. It retained its bright colors to the last. It was a female. I opened the abdomen and made a microscopic examination. It was very fat, but I could see nothing whatever to indicate the presence of eggs.

ANOSIA ARCHIPPUS, YET AGAIN.

BY J. ALSTON MOFFAT, LONDON.

In a series of most interesting and instructive articles on the Migration and Dispersal of Insects, by J. W. Tutt, F. E. S., editor of "The Entomologist's Record and Journal of Variation," London, England, after a reference to the methods of many different insects, he arrives in due course, in the July number, 1900, to a consideration of what has been written upon the movements, spring and autumn, of *Anosia Archippus*, Fab. (Fig. 7) and the claims that have been put forth for it, as differing in many respects from all other butterflies. The opinions that he has formed from a consideration of what has been written upon the subject, and the conclusions he has arrived at upon it, can be gathered from the following extracts taken therefrom:

"So far as one is able to get at the real facts (i. e., apart from the opinions of observers,) one is able to conclude that the movements of *Anosia Archippus*, in North America, are very similar to those of *Pyrameis cardui*, (the Thistle butterfly) in Europe." After quoting from various sources, Mr. Tutt adds: "All these irregularities of habit will be certain to strike one who has studied the subject, as being readily paralleled during a series of years by the immigrants of *Colias edusa* and *Pyrameis cardui*, and their progeny in our own country." That is, Britain.

After quoting a diversity of individual opinions and contentions, he continues, "However little definite information there is about the spring migration of *A. archippus*, a great number of observations have been recorded of a habit that is certainly unknown in any of our most observed Palearctic migrating species. This is the habit of swarming in the autumn." He then gives a large number of instances that have been observed by different persons, of autumnal swarms passing over various parts of the continent; then continues, "One other observation may be added, that of Bowles, who states that he has himself seen the shores of Lake Ontario, near Brighton, strewn with hundreds of their dead bodies, cast up by the waves, and which no doubt had formed part of a swarm, which from weakness or some other cause had perished while flying across the lake." Then Mr. Tutt sums up his conclusions upon the subject thus:

"From these and similar observations it has been concluded that the swarming of this butterfly in autumn is analogous with that of birds before commencing their flight

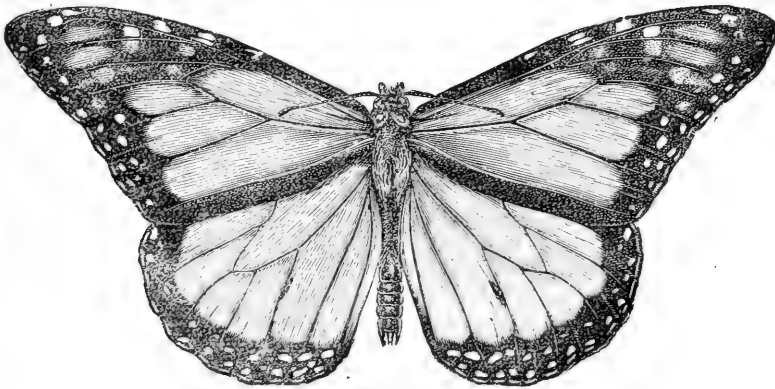


Fig 7.

southward, and that, after swarming, the butterflies return to the sub-tropical lands whence their grandmothers and great grandmothers set out in spring. It is admitted that the climate is such, in the northern territories to which the species annually spreads, that the butterfly cannot possibly exist in the winter, and Riley, who first propounded the return theory, himself confesses that "under the most favourable conditions a large majority perishes." As we have said, Scudder accepts the theory as fact, and practically writes as if it were proved beyond question of dispute. For ourselves, although we know of no exact analogy among butterflies of a similar swarming habit, yet, in every other respect the similarity between the habits of this species and our own European migrating species, *Pyrameis cardui*, *Colias edusa*, etc., is so great, both as to the continuous-brooded habit, and also as to Dr. Thaxter's observation that the males and females in the autumnal swarms pair, that we are inclined to doubt the conclusion. It has never yet been shown that the journey has been successful. The swarms are sometimes noted as going in a different direction from that assumed by the theory, and much more evidence is necessary before even an approximation to success can be admitted. For ourselves, we doubt whether the return journey has ever been successfully made, and we consider that there is altogether insufficient direct evidence to warrant the assertion that the autumnal swarms of *Anosia Archippus* migrate from the more northern parts of its summer range in America, to the south, in order to winter there. Some of the quotations which we have just reviewed, and others mentioned by Riley, show distinctly that he swarms do sometimes fly more or less from north to south, or from north-east to

south-west ; but the general opinion that one is compelled to form, after reading most of the notes relating to the autumnal swarming of this species is, that the large congregations of butterflies that then collect will, given fine calm weather, stay long (in swarms) in one place, and the evidence is altogether insufficient to show that these go south-west rather than in all (or any) directions apart from weather conditions."

When one's opinions are distinctly challenged, one naturally feels a desire to vindicate them ; and as there is much in these quotations that is in direct opposition to my belief on the subject, which has been largely formed upon actual observation, influenced no doubt by what I have read, I shall review them somewhat in detail, in an attempt to make it clear that I, and many others on this continent, have not wholly misunderstood what we have seen. Mr. Tutt seems to be needlessly skeptical on some points, in view of what he informs us of the wonderful performances of this butterfly, which he appears to accept ; and I doubt not that a little personal observation would convince him of it.

I know nothing of the habits of *Pyrameis cardui* in Europe except what I have read ; but in this country, my attention was soon attracted by its periodicity when I began collecting. I have seen in some seasons, cloverfields just alive with fine, large, rosy specimens ; whilst in others I have watched carefully for them all summer and not seen one. I have seen its larva in such numbers as to consume all the thistles in one field, and cross the road in masses to another for fresh food, whilst the whole neighbourhood became alarmed that their crops were to be destroyed by an invasion of the army worm. I came to the conclusion that they appeared every third year ; and sometimes then only in very moderate numbers, yet I never observed anything in any of its peculiar habits, to in any way correspond with those of *Anosia Archippus*. It is rather unsafe to draw, confidently, conclusions from analogy when dealing with insects.

In the quotations made by Mr. Tutt from the few recorded observations made by different individuals, of the movements of *Anosia Archippus* ; their gathering together in swarms preparatory to their migrating, and their passing over the country in flocks, have got somewhat mixed, some of them referring to the one, and some to the other. All admit their assembling ; the purpose of their assembling has to be inferred, which gives plenty of scope for the play of the imagination. The butterflies take weeks in collecting before they depart. Having chosen their rendezvous, they have to come together from a considerable extent of territory around, to accumulate the multitudes they often do, and that takes time. How those at a distance get to know of the spot is a very interesting and puzzling thought, but that they do in some way is a fact. Now, it is during this gathering process that the coming in the evenings and the going in the mornings has mostly been observed, and is usually kept up for a length of time, regardless of the weather. No one observing these movements could help wondering and enquiring what the object of such conduct could mean ; and if informed about their migratory habits, and watching them to the end, he would be satisfied that it was in some way intimately and directly associated with their intention to leave, and was preparatory to that very purpose. We cannot tell how their minds act in connection with the subject ; we can only express our convictions in accordance with the operations of our own, drawn from observation. As the time approaches for their departure, which for this locality is about the first of September, the great majority that compose the swarm, gets into that singular dormant and listless mood, which is another very perplexing state of mind to account for, but which no doubt is also intimately associated with their future intentions ; they will remain for days in what appears to be a state of semi-hibernation, when they show no great desire even for food. I have only once had the pleasure of watching one of these swarms assembling, but from all accounts it was quite characteristic of their doings at such a time. Some of my published observations will allow of expanding and commenting upon.

The woods where I saw the assembling of *A. Archippus* as recorded in Can. Ent. Vol. 12, p. 37, was that in which the asylum buildings at Hamilton now stand. My visits to it were made every other day. I saw the butterflies there three times, which would cover five days, and to the last they were perceptibly on the increase. I would get there about half past one, when I would find them hanging in clusters, quite motionless except when disturbed. That they should be there at that time of day, in that condition, caused me to wonder greatly. Whether they had been out in the morning or not I cannot say ;

but when I would be leaving about half past five, individuals were still arriving, and some of them had to descend quite a distance to the tops of the trees as if they had traveled from afar, and not at all like ones that had been feeding in the vicinity. During these observations the weather was fine, what it may have been when they left I do not know as I did not see them go, which must have occurred within three days after my previous visit. The swarm that I saw just starting out on its journey, Can. Ent. Vol. 20, p. 138, was in a locality about thirty miles east of Hamilton. I was there upon a visit, and had gone out to a field, with many bushes about stumps and fence corners, to look for moths and beetles. Whilst engaged in my search, my attention was diverted by the numbers of *Archippus* that were floating around me. When I looked up I at once realized what was going on. My eye traced the stream to a wood from whence it was issuing, which was on the far side of the field, and thither I made my way. As soon as I entered the wood I was struck with the contrast which the attitude of these presented to those of my former observation. There, quiescence; here, animation. Everywhere I looked there was movement; but not of the wings. The whole swarm was evidently controlled by one impulse; and in presence of it I could not resist the conviction that it was associated with their going. Were they just arousing themselves from a previous state of lethargy? The seemingly few that were on the wing and making for the open were coming from the far side of the wood, which was out of my sight, as well as of those that were near the front, and were closely following those that had already started. And this gives us a clear idea of how these long drawn out flocks that are so often seen passing over different parts of the country are produced, and I have always considered myself as particularly fortunate in seeing this illustration of how it is done. Although those high in the air were keeping to a comparatively direct course, there were hundreds of them in sight that were swooping and swirling around the bushes in the field; yet they never allowed a gap to form in the procession. The weather at the time was fine; no storms in view, past, present or prospective, to influence their movements.

That swarms will encounter storms, both while forming and upon their travels is certain, and that their movements will be to some extent modified by them is also certain. But my conviction is, that they will invariably choose fine weather for starting on their pilgrimage. Here is what Mr. J. A. Allen has to say of their movements in Iowa. Trans. Chic. Acad. Sc., i. 331. "This extremely abundant butterfly seems to prefer the open prairie, but is driven to the groves by the winds which sweep furiously over the prairies in the summer months, and especially in September; here the butterflies are collected in such vast numbers on the lee sides of trees, and particularly on the lower branches, as almost to hide the foliage, and give to the trees their own peculiar colour. This was seen not in one grove alone, but in all of those that were visited about the middle of September. If unmolested, they remained quietly on the trees; if disturbed by blows upon the trunk or branches of the tree they would rise like a flock of birds, but immediately settle again, either on a contiguous tree or upon higher branches of the same. At New Jefferson, a little later in the year, when the gales had abated, they were seen leaving the groves in vast flocks, and scattering through the air almost beyond reach of the eye." There we have a picture presented of collecting swarms. But I suspect that Mr. Allen has slightly mistaken the purpose of their collecting, which was not so much to obtain shelter from the furious winds, as to prepare for their future journey, as disclosed by their leaving later on. My impression is, they rather enjoy a stiff breeze, and understand well how to manage themselves in it. But what interests us most in this connection, is, that they did not start out until the gales had abated.

That these autumnal swarms of *Anosia Archippus* leave the northern portion of the continent and go southerly, is, I think, the firm conviction of most, if not of every entomologist in North America. Which is not surprising when we know that they have never been seen going in any other direction in the northern portion of it. That but few observations have been recorded by competent persons, compared with the importance of the subject, is acknowledged by all. That there are so few interested and competent individuals on the routes these swarms travel, to make observations, compared with the extent of territory over which they have to pass, is confessed and lamented by many; yet the few observations that have been made, defective as they are, when dates and localities are tabulated, exhibit a progressive movement in that direction, which sus-

tains and confirms the general opinion on the subject. Take these which are referred to by Mr. Tutt :

Saunders, Port Stanley, September 1st.

Scudder, New Hampshire, do 2nd.

Peabody, Wisconsin, do first week in.

Dr. Hamilton, New Jersey, do do do

Mundt, Illinois, do 7th.

Anonymous, Ohio and Indiana, September 19th and 20th.

Dr. Ellzey, Maryland, do 23rd and 25th.

Dr. Neal, Texas, October 4th and 6th.

Dr. Thaxter, Florida, being without date, may be placed anywhere between 1st November and last of February ; whilst he is reported in another place as having said, "that he had found *Archippus* wintering along the Gulf of Mexico in immense numbers." Which taken in connection with the fact that there is not enough of their foodplant there, to produce a tithe of them, is strong presumptive evidence that those there seen had come from the north, where we know they are bred in countless numbers. That many of the travellers will perish by the way is what is to be expected, but that the bulk of one of these swarms could not complete the journey from their northern limit to the Atlantic coast, is not to be thought of in connection with a butterfly that has succeeded in reaching a land 2000 miles across the ocean from the American continent.

In reference to Mr. Bowles's observation, Can. Ent. vol. 12, p. 134, which was a valuable addition to our information of its habits at that time, but proves nothing, except that the butterfly is a wanderer and liable to be overtaken by a storm and perish, whilst in the act of crossing our great lakes ; I have seen specimens of it that were thrown up with the drift on the north shore of Lake Erie. I have seen the west shore of Long Point strewn for miles with their wrecks after a storm. And I have picked up some of them, apparently dead, placed them in the sunshine and seen them revive and fly away. These were bright fresh specimens of that season's production. But that any of them had fallen into the lake from exhaustion by long continued flight, I would say for that butterfly ; never ! Its mode of flight is so easy and graceful, that it looks as if it could remain on the wing indefinitely without tiring ; it indicates amusement rather than labour. It never appears to be in a hurry ; unless it has got a fright, and then, racehorse speed is slightly suggestive. During oviposition, the female gives one the impression of her being intent on business ; and moving from place to place with great speed ; but her progress is made in long sweeping curves, with scarcely a flutter of the wings, which does not suggest exertion. It has a dexterous way of using a strong breeze to help it along. I have seen one go up the side of a two-storey house and over the roof without a flap of its wings. All it required to do, was to set itself at the proper angle and the wind did the rest. Even when they have started out upon their long journey southward, those near the ground do not reserve their strength by refraining from amusement. With many a sweep and swirl they are up and down, here and there and all around, yet never allowing themselves to fall behind the steadily advancing stream. Mr. Alexander of Her Majesty's Customs Department, Hamilton, informed me that on one occasion he was crossing Lake Erie from the American side, and that they sailed for hours through a flock of *Archippus* going in the opposite direction ; and when the steamer reached Port Dover the butterflies were still going out over the lake. And from his description of their behaviour on the water, it corresponded exactly with what I have so often seen upon land ; some high in the air, others skimming over the surface of the lake, or dotting the space between, whilst many found time to come on board, and investigate the mysteries of the deck.

As to its "continuous-brooded habit," I have never seen the slightest indication of such a thing in Ontario. From the time that freshly emerged specimens appear in July, to the time they depart in autumn, they never show the least regard for each other sexually. So marked is this feature of their conduct during that time, that it was asserted by some, that those great gatherings of them were composed entirely of one sex, but this was soon proved to be not the case : yet it brings to view how much that peculiarity attracted attention. Dr. Scudder claims "that no *Anosia Archippus* born northward ever lays eggs the same season ;" and I am quite prepared to believe it. On one occasion I obtained a chrysalis of that butterfly in the latter part of October, which matured by the

6th of November. Was this an attempt at producing a second brood? Reasoning from analogy one would unhesitatingly say, yes. But from all my observations of that butterfly, I as unhesitatingly say, no. It was but a retarded specimen from a more southerly born parent; and would probably not have matured in nature at all. It is no unusual thing to find dead chrysalids after frost that give no indication of being parasitised. Although Dr. Thaxter saw some of them in Florida making an attempt at producing a brood there, yet the fact that they were still in swarms, clearly indicated that their time for breeding had not yet come, or they would have been dispersed. Now then, seeing that fresh hatched specimens begin to appear here about the middle of July, and continue on the wing in increasing numbers to the beginning of September, when a great proportion of them takes their departure; and that portions of these same swarms may reach the latitude of Maryland about the end of September, Texas and Florida in October and November, that they winter along the Gulf of Mexico, or even further south, and that it will be the end of February or the beginning of March before their regular time of breeding begins, and that we have not the slightest reason to believe that they hibernate at all, anywhere, as *Antiopa* and the *Graptas* do; there seems to be a reasonable excuse for the belief that *Anosia Archippus* is a long lived butterfly, and that continuous-lived would be quite as appropriate for it, as continuous-brooded.

That any *Anosia Archippus* leaving Ontario in the autumn, will return to it in the spring to propagate its species, is a matter upon which we have no information whatever; and seems quite improbable. But that the first ones that appear here do come from the south of us, admits of no question. Yet the terms "north and south," are often used in such a loose and ill defined manner, as likely to cause confusion. Hence Mr. Tutt has tripped over my "doubtful logic," when speaking of their going south in the autumn, and returning in the spring; when it was the "species" that I meant, and not the individuals; which I ought to have made more clear.

There are but two statements that I can find, that provide any basis upon which to form a calculation as to the distance from which our first arrivals may have come. Edwards speaks from West Virginia, Riley, from Missouri. West Virginia is a long way south of Ontario; so we are not warranted in concluding that the behaviour of *Anosia Archippus* there will be identical with what it is here. Edwards in his life history of *Danaüs Archippus* (Psyche, Vol. ii, Dec. 1878, p. 169,) says: "In this part of West Virginia, *D. Archippus* is, I have reason to believe, four-brooded, and the butterflies of the last brood, and these alone, hibernate. The survivors appear very early in the next spring, and are always faded and more or less broken." And through that whole history, he makes his estimates upon the principle that it is a hibernating butterfly. Now the fact that Dr. Thaxter found it wintering along the Gulf of Mexico, utterly precludes the idea of its hibernating in any true sense of the word. So Mr. Edwards's "survivors" came from a good way south of West Virginia. Riley also speaks of it in the same way; which was quite excusable at that time, as facts to the contrary had not been disclosed, and they reasoned from analogy, and so the habit has been kept ever since; but we must now view it another light. Edwards's spring dates are, butterflies appear the last of March. Eggs laid the second of May, butterflies from these, thirtieth of May. Riley, 3rd annual Missouri report, p. 144, says: "They commence depositing eggs in the latitude of St. Louis during the fore part of May . . . Butterflies from these eggs begin to appear about the middle of June." These are the only observations made in the south, giving dates, that I find to estimate time and distance by. Now *Anosia Archippus* makes its appearance in Ontario about the first of June and before, according to the season. Are our first arrivals specimens that were born in either of those localities, or there-about? Certainly not from the Missouri broods. But West Virginia is the most likely direction from which our first visitors would come; and here again we see, that there is not sufficient time for the first Virginia bred specimens to make the journey to Ontario. Then whence do they come? Our only answer must be; from some broods born much further south than West Virginia.

As to "swarms going in the opposite direction," we have no spring swarms in the north. And those observed and recorded in the south, do not seem to seriously conflict with observations made in the north. The "bevy" that was seen in Texas the last day of March, containing thirty individuals, would not be considered in the north of sufficient importance to notice which way they were going. The report received by Riley from

Mr. Wells of Kansas, of a swarm which he saw in the middle of April, "that came rapidly with a strong wind from the north-west," seems to be of somewhat uncertain interpretation. But there is one thing I feel quite certain of, let *Anosia Archippus*, wherever, or in which ever direction it might be going, get caught in a gale it would head against it. I have seen individuals of them out in a gale that I could hardly hold against; low down, slowly but steadily making their way in the opposite direction, and that with little apparent flutter of the wings but with them closely reefed, until tired of the monotony of the procedure, or not wishing to go any further in that direction, they would suddenly shoot up and get hurled fifty or more feet in the direction they had come, then turn and go through the same performance over again. They may do the same in flocks, who can tell?

If I were undertaking to draw up a programme of the proceedings of this butterfly from my abundant lack of information; and filling in what I don't know with what I think is most likely, it would be something like this: *Anosia Archippus* is a southern butterfly, which has inherited a powerful migratory instinct, and is endowed with a capacity to indulge it to the utmost limit of its inclination. The northern portion of the American Continent, is where it finds the conditions most favourable for the multiplying of its species to an unlimited extent. But it cannot endure frost, therefore goes southerly in autumn, and with that purpose in view gathers into immense swarms before it starts out. It makes the journey in easy stages, spending months on the way. As it does not hibernate, it keeps on the move south-west until its breeding season comes round, when these, or more southerly bred specimens, start the northerly movement. Reference has been made to the habit of birds; an excellent comparison for my purpose. We know that they leave their southern residence for the north at a suitable period of the year, and by the time the species has reached its northern limit, the whole continent is uniformly stocked. No part missed, no part burdened with an over supply, and we know that the southern ones will be breeding before the northern ones have commenced building. Apply the same principle to our butterfly; only she has no building to do, and no care to take of her young, so she is not required to settle down in one locality, but may place one egg here and another there as she finds it convenient and pass on. Now I will accept and be guided by Mr. Edwards's observations in West Virginia, as to her conduct there, but not his conclusions. He says, (*Psyche* as previously quoted,) "The survivors (from hibernation) appear very early in the next spring, and are always faded and more or less broken (From much exposure and long travel as I believe). They may be seen * * * the last of March; * * the females deposit their eggs the last of April and early in May on the leaves of different species of *Asclepias*, beginning as soon as the plants are well out of the ground, and thereafter, without doubt, soon die, after the manner of their kind." In that we learn, that our southern born butterfly was not in a condition when she reached West Virginia to oviposit. That it took a month to mature her eggs. How many of those who started out with her, spent that month in going further north, and so have reached Ontario about their usual time? A few butterflies will stock a locality with a species, if eggs are all laid together at one time; which I think is not the case with this one, hence the absence of well defined broods. And Mr. Edwards proved that they do not "soon die" after finishing egg laying by capturing one on the 2nd of June, with her ovaries quite empty. So here we have still an interesting question to settle, how long do they live before finishing, when they survive for sometime after? Again Mr. Edwards says, "every female from which I have obtained eggs in confinement, later than May, and all those which I have noticed as they were ovipositing in natural state, have been fresh colored, and evidently not long from chrysalis; (I have witnessed similar phenomena in Ontario during the first part of July.) So I have no idea that this species differs in this respect from other butterflies. One brood of *D. Archippus* succeeds another the season through, the females of each brood depositing their eggs within two or three weeks after emerging from chrysalis, and soon after dying; and the last brood of the year hibernates, the females not to be impregnated till the next spring." Which would be all correct, if we were dealing with a species that goes the round of its life's history in one locality, hibernating there in winter, and producing its kind in summer, year after year as so many do. But analogy fails us here; for we have to do with a species that requires the continent for a home, ranging from a defined northern limit on the one hand, to an undefined southern extension on the other, with no apparent attachment to

a locality but what suits its present needs; seemingly conscious of its being but a transient resident anywhere; chased from the north by the approach of winter, it is compelled by a necessity of its nature to return to it in the spring. Leaving the north in united multitudes in the autumn, it returns to it by independent units in the spring; and believing that there are several broods of it in the south, and that each of them is controlled by the same strong desire to travel, which at that season means northward; and that these will follow the same route as did the previous ones, depositing eggs where some had been laid before; I get an explanation for the comparative freshness of the butterflies that are late in arriving at the north, and in the great disparity in the size of caterpillars found on the milk-weeds during the season. But where to draw the line between north and south for them, I will not undertake.

PARASITES IN THE EGGS OF CHRYSOPA.

BY J. ALSTON MOFFAT, LONDON.

On the 19th of June, 1900, whilst strolling in Victoria Park, London, my attention was arrested by an unusual looking object on the underside of a linden leaf, attached to a projecting branch a little above the level of my eyes. I plucked the leaf to closely examine it, but could not decide as to whether it was an animal or vegetable production. Afterwards remembering that I had seen an illustration somewhat resembling it, I turned it up, and found that singular object to be an egg cluster of the delicate lace-winged fly of the genus *Chrysopa*.



Fig. 8.

The Rev. J. G. Wood, in *Insects at Home*, page 281, thus discoursed upon the eggs of this insect: "They are generally deposited upon leaves, but, instead of being laid directly on the leaf, every egg is fixed to the end of a slender footstalk about half an inch in length. This footstalk is formed from a viscous matter secreted by the female, and is delicately white and translucent. Mr A. G. Butler, of the British Museum, told me that he has kept lace-winged flies, and often seen them lay their eggs. The end of the abdomen is first pressed against the leaf, and a tiny drop of the viscous matter deposited. The abdomen is then raised quickly so as to draw out a thread, which becomes stiff and hard almost as soon as it comes into contact with the air. Then the insect pauses a little, and rapidly places an egg on the end of the thread, fixing it there with another drop of the secretion. The eggs are always laid in groups. . . . They bear a curious resemblance to the capsules of certain mosses, and indeed have been described and figured in books as specimens of British moss". Which is not very surprising, as they instantly suggested a moss in fruit, but much more slender than any moss that I had seen.

There were thirty-four eggs in the cluster, and a single one placed on the upper side of the leaf. The eggs were about the thirtieth of an inch in length, and about as long again as they were wide. The stalks would bend to every breath, like a field of heavy laden grain before a breeze; giving the impression that they were top-heavy. I placed the leaf in a box and awaited developments. In a day or so the eggs changed colour, becoming darker, and I fancied larger. One morning on taking my accustomed view, some of the eggs had become white, and upon applying a lens I found they were empty, nothing but an extremely thin shell left with a hole in the top, out of which an insect had come. I then made diligent search to find them, when I at last discovered three tiny creatures in a depression of the leaf near the mid rib, as if they had therein sought safety and shelter. They were about three times as long as they were wide, and each armed with a pair of tremendous jaws which appeared to form quite one half their entire length; reminding me of the ant lion, to whom it is said to be related. That was my only view of them, for the next time I looked they had all disappeared. Having no Aphides to feed upon, probably the stronger devoured the weaker and then escaped from the box. Six of the eggs had matured and given forth their contents, whilst in the meantime the others had assumed a laden hue. On the 28th of the month I was looking at them to see if there were symptoms of change, and wondering what might be the cause of their present

appearance, I observed a dark speck moving rapidly on the white paper with which the box was lined, and on examining with a lens I discovered it was a fly. It was honey-yellow in colour; its head was wide and squarish, with thorax of similar width, and abdomen tapering suddenly to a point. Its eyes were situated on the outer corners of its head, like those of a *Cicada*, dark colored and prominent. Its wings lay flat on its back, and projected half their length beyond the abdomen. It was very active, running rapidly and disappearing by flight every now and again, to reappear in another part of the box. I now turned my attention to the discolored eggs, and found several of them had holes in their sides out of which *Ichneumons* had escaped; and probably that fly was one of them. Upon making a closer examination all the discolored eggs had on their surface, what were in all probability *Ichneumon* eggs, and upon one of them I counted six. Clean-cut round holes out of which *Ichneumons* had escaped were found, variously located on some of the *Chrysopa* eggs, but in no instance had there more than one parasite matured in any one egg, and the great majority of them had not given forth any. There was abundant evidence to prove it a clear case of overdone parasitism, and that the most of the parasites had failed to mature from lack of sustenance. Many of the *Chrysopa* eggs exhibited several circular markings on their shells, as if they had been made on the inside preparatory for the escape of the fly, which had died before accomplishing it; whilst others shrunk and cracked upon drying.

A manifestation of this sort seems like a great waste of energy in nature, and a lack of intelligence on the part of the creature committing it, which is hardly in accord with the theories promulgated by some writers about the forethought exercised by forms of life, for the progress and improvement of their kind. In this instance we see merely a female *ichneumon*, constrained by the controlling impulse of her nature to deposit her eggs. Having found a cluster that answered her purpose, she fulfilled her mission regardless of consequences; and whilst she overlooked some of the eggs, she deposited far too many upon others, which came very near exterminating a whole brood of this useful insect; whilst at the same time she nearly extinguished the life of her own offspring. Therein giving us a fine illustration of how the works of nature are carried on under an established government by law; when each individual is strictly following the controlling impulses of its own nature, and yet is not prevented from taking a departure from routine in case of an emergency.

THE DRAGON-FLIES OF THE PROVINCE OF QUEBEC.

By REV. T. W. FYLES, D.C.L., F.L.S.

Among the most beautiful of the insect tribes are the dragon-flies. The imposing size of many of the species, the brilliant colouring of their eyes and bodies, their wide-spreading, closely-reticulated wings, the rapidity of their flight, the dash and *elan* of their approach, the rustle of their wings as they sweep around, fill the intruder upon their haunts with admiration.

This admiration is increased when an opportunity is afforded for a close examination of one of these remarkable objects. The head of the insect seems to be made up mainly of eyes and mouth. The innumerable facets of the protruding, compound eyes glow with prismatic hues. In *Æchnidæ* and *Libellulidæ* these eyes are contiguous, and there is but a very small space between them and the mouth organs; but in this small space there are three ocelli or single eyes. The dragon fly can see above and below, behind and before. It detects every motion of its enemy or its prey, and its powers of flight enable it to escape from an assailant and overtake a fugitive.

The mouth of the dragon-fly is furnished with two large flat lips, which work up and down, and enclose the mandibles and maxillæ like a visor. When the creature is feeding this motion of the lips would lead one to think that the jaws move vertically, instead of horizontally, as is really the case.

Besides its powers of sight and its formidable mouth-organs, the dragon-fly has an advantage which many other insects have not—its head moves freely on its neck. It can turn its head half way round. Woe to the unhappy insect that comes in the way of so formidable a spoiler!

The thorax of the dragon-fly is capacious and somewhat barrel-shaped. It contains

the powerful muscles necessary to move and control the four ample wings and the six legs of the creature.

The abdomen extends far behind, to steady the insect, and to aid in steering its flight; but in the Libellulidæ it is somewhat flattened and ends with a point. In *Corduligaster* the cylindrical abdomen ends with a knob or swelling, hence the name, a club, a paunch. In *Gomphus* the abdomen is spatulate at the end.

July and August are the months in which the dragon-flies abound. Then every pool, every stream, is frequented by them. Sometimes the observer may see them in the act of depositing their eggs. They alight upon the flags, arrowheads and other aquatic plants, and taking suitable positions dip their abdomens into the water, and deposit their eggs in masses upon the stalks and leaves beneath the surface.

The embryos, in different stages of their growth, have been observed and figured, and the larvæ of various kinds are known. To the possessor of an aquarium the study of the habits of the dragon-fly, in its early stages, would afford great pleasure.

A dragon-fly larva is a wonderful thing. At first sight the uninstructed observer does not see much to admire in it, but closer examination reveals features of exceeding interest. One of these is the extraordinary under lip of the creature, which takes the

form of a jointed arm, furnished at the extremity with nippers for securing its prey. When not in use this instrument is neatly folded under the throat of the larva—it is called "the mask" (Fig 9). Then too, the peculiar arrangements by which the insect obtains oxygen, its vital breath, from the water, are worthy of notice. It has no head gills, as the fish has; no branchiæ like the larva of the Horned Corydalis; no breathing tube like that of the rat-tailed maggot of *Eristalis*. The respiratory organs lie within the abdomen, and the water is admitted to them through an orifice furnished with five angulated plates, which open or close as need requires. Ordinarily the process of the alternate admission and expulsion of the water goes on with easy regularity; but when the creature is alarmed or stimulated by the sight of its prey, the water within its body is expelled with sudden force, and the tiny current, impinging upon the inert volume around, sends the insect forward



Fig. 9.—The left figure represents the larva with its protruded lip in the act of seizing its prey; the right shows the perfect insect emerging from its pupal case.

ward with a rush, as the rocket is sent through the air by the pressure of the gases suddenly generated by the combustion of the materials with which the case is filled.

The metamorphoses of the dragon-fly are incomplete. At the pupal change the insect does not become quiescent, nor does it cease to feed—it retains its active habits and voracious appetite. When the time comes for it to assume the imago state, it climbs some plant or other object till it is clear above the surface, and then its skin bursts along the thorax and the perfect insect crawls out of the opening and leaves its old habit, attached by the claws, as a memorial of its former state. (See Fig. 9.)

Having thus introduced the Odonata, and given some glimpses of their habits, we will now notice their classification.

They are divided into four families: AGRIONIDÆ, GOMPHIDÆ, ÆSCHNIDÆ, and LIBELLULIDÆ. These are easily distinguished each from the others.

The Agrionidæ have the eyes wide apart and placed apparently on pedicels.

The Gomphidæ have large eyes, near together, but not touching each other.

The Æschnidæ and Libellulidæ have eyes that are contiguous. In the former the labial palpi have three joints; in the latter the joints of the labial palpi number

The following is a list of the Dragon-flies accredited to the Province of Quebec :

AGRIONIDES.

Calopteryx, Leach.
Splendens, Selys.
Virginica, Drury.
Maculata, Beauv.
Lestes, Leach.
Unguiculata, Hagen.
Agrion, Fab.
Hageni, Walsh.
Ramburii, Selys.
Iners, Hagen.
Positum, Hagen.
Saucium, Burm.
Civile, Hagen.
Durum, Hagen.

GOMPHIDES.

Gomphus, Leach.
Vastus, Walsh.
Fluvialis, Walsh.
Fraternus, Say.
Exilis, Selys.
Spinus, Selys.
Rupensulensis, Walsh.
Colubrinus, Selys.
Corduligaster, Leach.
Lateralis, Scudder.
Obliquus, Say.
Petalura, Leach.
Thoreyi, Hagen.

ÆSCHNIDES.

Anax, Leach.
Junius, Drury.

Æschna, Fab.

Constricta, Say.
Vinosa, Say.
Verticalis, Hagen
Heros, Fabr.
Janata, Say.
Septentrionalis, Ramb.

LIBELLULIDES.

Macromia, Ramb.
Transversa, Say.
Illinoisensis, Walsh.
Epithea, Charp.
Yamaskanensis, Prov.
Forcipata, Scudder.
Princeps, Hagen.
Elongata, Scudder.
Albicincta, Burm.
Linearis, Hagen.
Cordulia, Leach.
Uhleri, Selys.
Lateralis, Burm.
Plathemis, Hagen.
Trimaculata, De Geer.
Subornata, Hagen.
Libellula, Linneus.
Quadrifaculata, Linn.
Pulchella, Drury.
Exusta, Say.
Diplax, Charp.
Rubicundula, Say.
Scotica, Donovan.
Hudsonica, Selys.
Intacta, Hagen.

Many of these species are reported to have been taken on the Yamaska River.

Space would fail me to give particulars of all these species. Their acquaintance can be made by degrees. But a few words on the appearances of some of the most common and most noteworthy species may be acceptable.

First then, the beautiful "Damoiselles" (as the French call them) will be readily brought to mind. They may be found, in their season, on the banks of all our streams, and they are particularly abundant along the brook that crosses the road at St. David. These insects of the genus *Calopteryx* have wide-spreading equal wings, and long, slender, stately and deep green bodies.

Much smaller, but equally beautiful, are the various species of *Agrion*. They frequent our quiet pools, and flit with ease and grace, from tuft to tuft of the herbage that abounds in their favourite haunts. *A. saucium* is bright red, like sealing wax. *A. civile* is a beautiful blue—one might fancy that it was a thread fallen from the mantle of the summer sky.

One of our most common dragon-flies is *Gomphus vastus*. It may be known by its black and yellow livery, and by the remarkable widening out of the three abdominal segments immediately before the last. This species abounds in the woods around Fort No. 2, Levis. I have no doubt that its larvæ may be found in "Mer de-Papon" and other pools in that neighbourhood.

The *Æschnide* are large and handsome insects. The rarest of them in these parts is *Anax junius*. I saw a pair of these sporting over a sheet of water near Spruce cliff last season, but they were careful never to come within reach. *Æschna septentrionalis* is often met with. It is that large black and bright blue dragon-fly with hyaline wings of a faintly green cast—the stigma being long and brown. I always look upon this as the typical dragon-fly, "the Devil's darning-needle, the "Horse-stinger" so dreaded by children. I need not say that it is quite incapable of injuring either horse or man.

The species of the genus *Libellula* are all handsome insects. Their abdomens are dagger shaped, ridged down the middle, sloping to an edge on either side and pointed at the extremity. The female of *Trimaculata* has three brown patches on each of its wings—one patch at the base, one in the centre, and one at the tip. The spaces between are clear. The male (Fig. 10) has a patch at the base of each wing, but the tip of each is clear, and there is a large brown patch in the centre extending from the costa to the inner margin. The abdomen of the male is of a bluish white, as if it had been painted. A much larger and more beautiful insect is *Pulchella*. This also has three patches on each wing, but of a richer brown than in the last instance, and the spaces between the patches are clear white. *Quadrимaculata* is another very beautiful insect in this genus. It may be known by the golden yellow streak, and the two rich brown spots on each wing, and the angulated patch at the base of the secondaries. The abdomen of this handsome insect is brown, and has a row of yellow spots on either side. *Quadrимaculata* is found in Europe as well as in America. It was named by Linneus. It is very plentiful at the "Gomin." It breeds, no doubt, in the pools that lie to the south of the swamp.

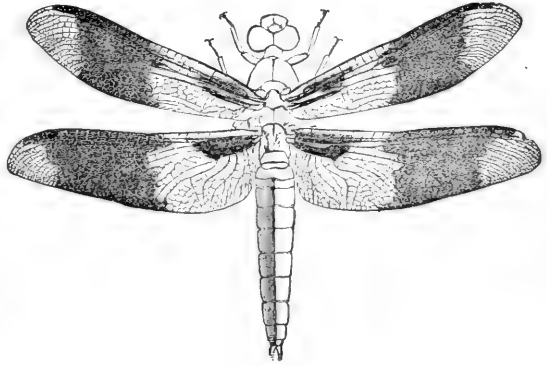


Fig. 10.

Of the genus *Diplax*, *rubicundula* seems the most common of our species. It abounds on the Chaudiere River. Insects of this genus may be readily known by their smaller size, their awl-shaped abdomens, and the very distinct stigmata of their hyaline wings. (Fig. 11 is the male of *Diplax Berenice*; Fig. 12 the female; Fig. 13 *Diplax Elisa*).

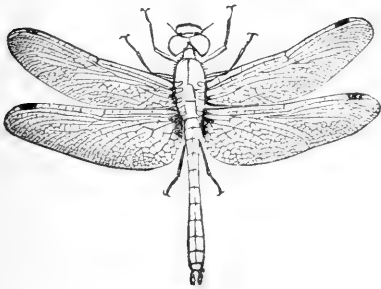


Fig. 11.

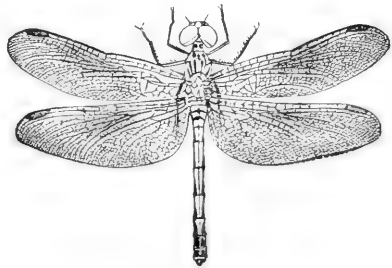


Fig. 12.

And now it may be asked, what useful purpose do the dragon-flies serve in the economy of Nature? We will take the liberty of meeting this question with one or two more. Did you ever go into the woods when the mosquitos were in strength, and thirsty for blood? Did you ever sail on one of our rivers—the Ottawa for example—when the shad-flies covered every inch above the tide of the vessel you were in? If you have, you will have said to yourself, if not to others, what a nuisance these things are! Now the dragon-fly spends the whole of its existence in the endeavour to keep down the numbers of such pests as these. It is a sportsman ever on the watch for its game, and when this comes in view it pursues it with energy and success. If it were not for the dragon-flies and other predacious tribes the troublesome insects would increase to an intolerable extent.

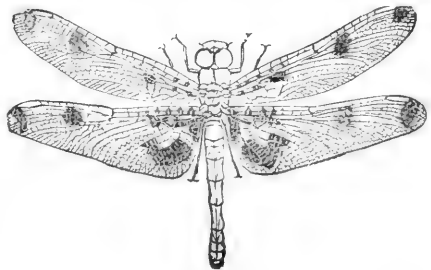


Fig. 13.

THURSDAY, NOVEMBER 15TH, 1900.

The Entomological Society resumed its sessions at 11 a.m., the President, Rev. Dr. Fyles, in the chair. After the reading of a paper by Mr. Henry H. Lyman, of Montreal, on "Specimens of *Spilosoma Congrua*, Walker, and kindred species in the British Museum," the meeting proceeded to the election of officers for the ensuing year, which resulted as on page two.

A number of papers were then read, followed by brief discussions in each case. After an intermission for lunch the meeting continued till five o'clock p.m., when the members from a distance left to catch their respective trains. Votes of thanks were adopted to Dr. Fletcher, Mr. H. Hague Harrington, and Mr. C. H. Young, of Ottawa, for their kind donations of rare specimens to the society's collection. Letters of apology for non-attendance were received from Dr. Wm. Saunders and Mr. Harrington, Ottawa; Mr. J. D. Evans, Trenton, and Mr. D. G. Cox, Toronto.

A large case of rare Lepidoptera was exhibited by Dr. Fletcher, special mention being made of many of the specimens. These had all been taken in Canada, mostly during the past year, and those of which special mention was made are the following:

Papilio Brucei. A specimen of this rare butterfly was taken at Regina by Mr. T. N. Willing, and along side of it was shown a bred specimen which Dr. Fletcher received from Mr. W. H. Edwards. This Dr. Fletcher believed to be the first record of this insect having been taken in Canada, although it is mentioned in a list received from Mr. J. W. Cockle, of insects he has taken at Kaslo in the Kootenay mountains.

Vanessa Californica. Some beautiful bred specimens were exhibited, pupæ of which had been sent from Kaslo by Mr. Cockle. This is a seasonal insect which is usually rare but occasionally very abundant.

Attacus Ceanothi. A specimen of the moth bred from cocoons received from Mr. E. W. Haines, who formerly took a female at New Westminster, B.C. and has since bred two broods of the species in confinement in England. A fine series of inflated larvae showing every stage was also exhibited.

Memythrus (Sciapteron) tricinctus bred from cotton-wood twigs sent from Ottonwood, N.W.T.

A fine series of Arctians, including a beautiful series of *Arctia phalerata* with inflated larvae in all stages, which were described in full in a paper by Mr. Arthur Gibson, A. Caja, var *Americana*, *parthenos*, *Parthenice*, *Yarrowi*, from Hudson Bay, *determinata*, *vittata*, *Anna*, *figurata*, *Williamsi*, *Blakei*, etc., were shown.

Colias Eurytheme. Some interesting specimens of this species showing all the recognized forms and all collected at Ottawa, were shown. This has been one of the characteristic insects of the year and has been unusually abundant throughout Ontario.

Terias Lisa. A nice female taken at Ottawa by Mr. Gibson on the 18th Oct

Pseudolimacodes littera. A fine specimen of this pretty little moth, also taken at Ottawa by Mr. Gibson was shown.

Thecla Damon. A specimen taken at Picton on the 24th May last, by Dr. Fletcher.

Pieris rapae. An interesting series showing many variations was exhibited, including the buff female, and the very rare yellow female, the variety *novangliae*. The males of this variety are not uncommon, but the female is extremely rare. Dr. Scudder mentions that Curtis took a yellow female in England many years ago, and there are doubtless others but they are not recorded. Taken at Ottawa by Mr. Gibson, 18th Sept.

Peridroma saucia and *Noctua C. nigrum*. These were the two devastating cutworms of the year. The former throughout the Province of British Columbia and the latter in Central Ontario. Beautifully inflated larvae in the last two or three stages were exhibited, with the moths.

Pamphila Zabulon and *P. Hobomok* were shown in both sexes and the differences pointed out. It was claimed that these were distinct species and that *Hobomok* was probably the only one that occurred in Canada. The members were asked to be on the lookout for specimens of *Hobomok* which had not the veins darkened where they crossed the yellow colour of the disc. If they found one it would probably be the true *Zabulon*. *Zabulon* has no yellow female, but *Hobomok* has both a yellow female and a black female variety, which is called *Pocohontas*.

Euptoieta claudia bred from violets from Kinistino, N.W.T. Butterfly, larva, and pupa.

Pyrameis carye, butterfly pupa and larva. The larvae of this species were found by Mr T. N. Willing feeding on Nettle at Regina.

Cacaecia parallela. Larva, pupa and moths. A troublesome pest in a greenhouse at Hamilton.

Anacamptis lupinella. A new species of tineid bred from lupin collected at Toronto. Larva, pupa and moths.

The following specimens of insects were kindly presented to the Society by Dr. Fletcher:

Vanessa Californica,
Plusia rectangulum,
Plusia mortuorum,
Xylina contenta,
Lithomia germana,
Arctia phalerata,
Culex pungens,
Culex stimulans,
Anopheles quadrimaculatus,
Anopheles punctipennis,
Anthophilax malachiticus,
Arctia Williamsi.

A beautiful collection of inflated larvae was exhibited by Mr. Gibson. These had been collected during the past summer and showed several of the species in all their moults.

A fine case of rare moths taken at Ottawa was sent for exhibition by Mr. C. H. Young, of Ottawa, who kindly presented the Society with a beautiful pair of *Plusia aereoides*.

A box containing twelve species of rare *Proctotrypidae* not in the collection of the Society was presented by Mr. W. H. Harrington, of Ottawa.

THE SILKWORM INDUSTRY IN ONTARIO.

By PROF. W. LOCHHEAD, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

The purpose of this article is to answer the question: Is a silkworm industry possible in Ontario? This question has been asked frequently during the past season, and invariably by persons residing in the county of Essex. The question is a very important one, for if the conditions be favourable for the establishment of such an industry considerable additional revenue would soon flow into the county, and enrich those engaged in the industry.

The various factors bearing on the successful establishment of a silkworm industry will be briefly considered.

During the past season Rev. W. M. Fleming, of Essex, reared a large number of silkworms from eggs, and had remarkable success in the production of silk cocoons. So gratified was he with his success that he naturally began to ask himself the question: Why cannot a silkworm industry be established in this country? In letters to the Department of Agriculture he advocated the breeding of silkworms as an industry which might be carried on very profitably by persons in poor circumstances, who had no regular employment, where the women and children could attend to the feeding and care of the worms.

The writer had occasion recently to visit Essex, when he made a point of inquiring into the silkworm conditions of the locality. Several prominent persons of business persuaded by the success of Mr. Fleming were of the opinion that cocoons could be produced in paying quantities, and were anxious to try further experiments next season. Moreover, many persons, uninformed as to the market conditions, felt that the Government should start a series of experiments to determine the feasibility of the whole project, and give aid in the form of a bonus.

The conditions necessary for profitable production of raw silk are: 1. Cheap labor, and many laborers. The chief silk-producing countries are those bordering on the Medi-

terranean, and in the far East where labor is very cheap. Experience, moreover, has shown that many laborers are required to provide food for the silk worms during the last ten days, just prior to the spinning of the cocoons. 2. Suitable food-plants upon which the worms may live and grow. The mulberry leaves are the staple article of diet in Europe and Asia, but in the United States it has been shown that the leaves of osage orange form just as good a diet as the leaves of mulberry. 3. Suitable climatic conditions of temperature and moisture. Experience again has shown that the silkworms may grow well in many countries, and slight changes of temperature do not affect their well being to any appreciable extent, although of course they thrive best in warm, semi-tropical countries. 4. A ready market for the cocoons, or rather the reeled silk. Here again the cheaper labor of the Old World tells against the development of silk industry in this country, and to sell the reeled silk in France or Italy means such a great reduction in profits that our people could not compete.

On inquiry in Essex regarding the extent to which the county could fulfil the foregoing conditions, the writer learned that the labour was to be done chiefly by the women and children, and only during the last few days would extra help be required. Skilled help would be secured at this critical period, for many factors enter into operation during the last few days which are of vital importance in successful rearing. The worms are ravenous, and the amount of food consumed is simply marvellous. Fresh leaves must be secured and given regularly so that the worms may feed continuously. When the food-plants are not close by, the task of feeding many thousands of worms becomes too heavy for women and children, and extra help must be obtained. Again, the worms must be carefully watched at the time of spinning the cocoons to prevent two worms forming one united cocoon, as is often the case where the worms are kept too crowded. Then, again, the cocoons must be secured and the enclosed pupae killed within the cocoons. The best method of killing the pupae is to place the cocoons in an oven heated to about 194 degrees F. All this work involves care, and if the silk growers procure their own supplies of silkworm eggs for the following season some additional care is necessary. The moths are allowed to escape from the cocoons which they usually do about two weeks after the spinning of the cocoons.

Essex county is fortunate in having a mild climate, one in which the mulberry and osage orange trees grow quite readily. Both the Russian and the native species are common, and two or three years would suffice to grow mulberry trees of such a size as to feed the silkworms of a large industry. Osage orange trees, too, are very abundant, and miles of hedges can be seen by driving along the roads of central Essex.

Through the kindness of Director Stupart, of the Meteorological Office, Toronto, the writer is able to give a comparison of mean temperatures of Essex county and Central France, the great silk-producing region of France. The mean temperatures for the months of April, May, June, and July are given below :

	Claremont, France.	Moulins, France.	Windsor, Ontario.
April.....	51.1	50.0	45.7
May.....	56.1	56.8	58.0
June.....	62.2	63.1	67.7
July.....	66.6	67.6	68.5

During the last week of May and the whole of June the silkworms are feeding, and by the first week of July the cocoons have been spun. From the table presented above it will be seen that the temperature of Essex differs but a little from that of Central France during the critical period.

The practical experiments carried on by the United States Department of Agriculture from 1884 to 1891 show conclusively that a most excellent quality of silkworm cocoons could be raised over most of the United States; and Dr. Howard, U. S. Entomologist, states as his opinion that the silkworm could without doubt be grown successfully in lower Ontario; but the absence of a home market for the cocoons puts the industry for the present out of the region of possibility. There are no establishments in the United States for reeling silk from the cocoons. No person could be induced to start reeling establishments for the reason that "no silk reeler could afford to pay a price for cocoons which would induce even the poorest of our citizens (or even non-producing mem-

bers of the family) to undertake the more or less arduous labors of raising worms. It was found impossible to convert the cocoons into raw silk, namely, to reel them in this country in competition with the cheap labor in foreign silk-producing countries."

In 1890 it was shown that even with the introduction of improved automatic, electric silk-reels it was impossible to compete with Europe and Asia without the imposition of a customs duty of not less than \$1 per pound on reeled silk imported into the United States.

A few facts regarding the weight of silk-moth eggs and cocoons may be interesting to persons who intend experimenting with silkworms. One ounce of eggs contains about 40,000 eggs (in France a family usually undertakes to rear this quantity). From these are obtained from 80 to 120 pounds of cocoons, which yield from 11 to 17 pounds of reeled silk. About 300 medium-sized cocoons weigh one pound, while the silk reeled from these weighs about one-eighth of a pound. In other words, 2,500 medium-sized cocoons will yield one pound of reeled silk.

The life-history of the silkworm (*Bombyx mori*) is very instructive and interesting. Each female moth lays nearly 500 eggs in a cluster soon after she emerges from the cocoon about the first or second week in July. The fertilized eggs are dark-colored, while the unfertilized ones are white or grey. The young worm on its first appearance is nearly black, covered with stiff hairs, and is about one-eighth of an inch in length. It becomes full grown in about twenty-eight days, during which time it has moulted four times, becoming lighter in color with every moult. When mature it is creamy white, has a prominent projection on the dorsal surface near the end of the abdomen, and is two or three inches long. The spinning of the cocoon occupies nearly three days. The threads of silk are viscid for a few days and consist of two fibres secreted by two glands which run along the sides of the body and open together on the under lip of the worm. This double thread is said to be about 4,000 yards in length.

The pupa moults once within the cocoon, the skin of the first moult usually remaining attached to the inner surface of the cocoon. The color of the cocoon may be white, or yellow, or orange, and investigations fail to reveal the cause of the variation in color. In four or five days after the cocoon is made the silk is ripe, when the pupa may be killed by heating the cocoon to a temperature of 194 degrees F. in an oven as already mentioned. If the moth is allowed to escape one end of the cocoon is broken, thereby injuring the continuity and excellence of the silk threads.

The moth is whitish or cream-colored; its fore-wings are falcate, with one or two brownish lines crossing the wing. The moths are not inclined to fly much, and are easily kept in confinement until the eggs are laid. There is but one brood a year, but the greater part of the year is spent in the egg state. The active period covers little more than six weeks, of which four weeks are spent as worms.

Concluding, the present market condition for reeled silk precludes the possibility of the establishment of a silkworm industry in Ontario, and "serious disappointment will surely follow exaggerated ideas upon the subject of silk-raising for profit, and if any person is contemplating such a course he is very strongly dissuaded therefrom."

Dr. Fletcher spoke of the interesting character of the paper and said that the Government at Washington had given up its experiments with silkworms because the French manufacturers would not pay for the cocoons a price that would remunerate American labor. In France they kept the eggs in a cool place so that they might not hatch till the mulberry trees were in leaf; if they should hatch too soon they could be fed upon lettuce, but this food was not safe, as it often produced diarrhoea in the caterpillars. He referred to the fact that most schoolboys in England reared silkworms for amusement, and in consequence a very large number became deeply interested in entomology.

RESULTS OF SOME APPLICATIONS OF CRUDE PETROLEUM TO ORCHARD TREES.

By F. M. WEBSTER, WOOSTER, O.

The varying and sometimes disastrous results obtained from the use of refined petroleum, on growing trees, as an insecticide, and especially against the San José scale, has led to the suspicion that the crude product might be less variable and drastic in its effects.

But so far as it has been used it would appear that we have yet much to learn, before we can, with safety, recommend the application of the crude product to the different varieties of fruit trees. That it is efficient in destroying the San José scale, if it is brought in contact with this insect, seems now quite probable. But the hundreds of dead trees that mark the areas where it has been indiscriminately used, point very clearly to the fact that great caution is necessary, and no one is, as yet, able to say just where safety ceases and danger begins. Then, too, when no permanent injury is apparent, as in the case of the seedling apples on the grounds of the Ohio Agricultural Experiment Station, at Wooster, Ohio, who can say that this unnatural retardation may not, after the first application prove to be a menace to the life or general vigor of the trees? It is well known that, in nature, these retardations sometimes occur, but nature seldom, or never, covers the bark of a tree or a shrub, and then only in part, with vegetable growths like lichens, and even these are known to be detrimental, a smooth, clean bark being always desirable.

In the use of refined petroleum, one of the most perplexing phenomena observed was the fact that, equally careful applications, made by the same person, with the same grade of oil, would give almost opposite results. Hence, recommendation of the refined product for general use has, in many cases, resulted disastrously and brought no little disrepute to the entomological fraternity of this country. The most that can now be said for the refined product is that a ten to twenty per cent mixture with water constitutes a fairly successful summer wash and destroys the young scale, thereby checking the increase and spread until applications of whale oil soap mixtures can be made.

In the use of the crude product, I have seen some of the most astonishing results obtained, but, as with the refined, I have seen also the most disastrous effects. Perhaps the uncertainty of effects in using crude petroleum in the orchard may be best illustrated by giving the results obtained, this year, by Mr. N. A. Hadden, of Catawba Island. Mr. Hadden used crude petroleum on the strength of recommendations from New Jersey, including those published by Prof. John B. Smith, and contrary to the advice of some of his neighbors. As I knew nothing of the matter until some weeks after the latest applications, nothing could have been said or done by me to in any manner influence Mr. Hadden, who followed his own course, and, I may add, has offered me every facility for observing the final results.

About 50 peach trees of the Crawford's late variety were sprayed March 10, 1900, with 100 per cent crude petroleum from an oil well near Gypsum, Ottawa County: Distillation B. The spraying was carefully done and none of the petroleum was allowed to run down the trunks of the trees. The effect on these trees was to kill every one of them. Two other blocks of peach trees on which crude petroleum from the same well was used, were also totally destroyed. On the same day, March 10, 1900, six plum and one peach tree were sprayed with crude petroleum from the same well and of same strength. Two unhealthy plum trees died; the other four were uninjured, as was also the peach, which not only made a vigorous growth but bore several peaches. Several rows of Smock and Salway peaches were sprayed April 7th with 100 per cent crude petroleum, and, though not showing serious injury on May 16th, in July 90 per cent were dead and the remainder fatally injured. Crawford's Late, sprayed March 8th with 10 per cent crude petroleum, and another block sprayed with a 40 per cent mixture, were not seemingly injured, but bore no fruit. Eight apple trees and several peach trees, sprayed March 8th with 10 per cent crude petroleum, were uninjured.

On the premises of C. W. Shoemaker, at Waterville, Ohio, there stands a Wilder Early pear tree, that for several years was badly affected with the Scurfy Bark louse. The tree was stunted and made little growth each year. Two or three years prior to 1900 the tree was sprayed in spring with kerosene emulsion, which killed many of the insects, and the tree afterwards made a better growth than it had previously done. April 2nd, 1900, this tree was painted with crude petroleum, the analysis of which I have not been able to secure. On August 17th, 1900, I saw the tree, and the bark still gave good evidence, by its colour and shining appearance, of the presence of the petroleum. The growth has been vigorous and the foliage was of the most healthy colour. The Bark-louse seemed to have been quite exterminated.

On March 23rd, 1900, a row of three year old seedling apple trees, on the Station grounds near Wooster, was treated with crude petroleum of different strengths, applied with a Deming kerosene attachment, the applications being made by two of my assist

ants, Messrs. Newell and Roubush. This petroleum was taken directly from oil wells at Lodi, Southern Medina county and its chemical composition is shown in "analysis A." Different trees were sprayed with different strengths of the oil, varying from 10 per cent. crude petroleum and 90 per cent. water, up to 100 per cent. crude petroleum. In no instance were the trees permanently injured. The effect was simply to retard the development of the foliage, until about the middle of May. May 7, many varieties of apples were in full bloom. The Winesap and Rome Beauty were showing their first unfolding blossoms. Strangely enough, the effect was rather more marked where the 10 per cent. solution was used. Where we used the 40 per cent. the retardation was less than where we used the 20 and 50 per cent. crude petroleum; the effect of the 40 per cent. being about the same as the 100 per cent. The 30 per cent. was almost the same in its effects as the 10 and 100 per cent. mixtures. June 13th, an examination of the trees showed that the normal amount of foliage had been put forth, and the leaves were exceedingly healthy in appearance and seemed larger than those on the unsprayed trees. An examination of the trees the middle of October showed that the first sprayed trees were really holding their foliage better than the unsprayed. Nearly all of the leaves had dropped from the latter while scarcely any had fallen from the sprayed trees. The tree sprayed with the 100 per cent. crude petroleum seemed to have held its foliage better, and the colour was more fresh and vigorous than on those sprayed with the diluted petroleum.

While all this indicates that crude petroleum may be used once upon apple with a strong probability of no detrimental results occurring from its use, nevertheless, the question is yet to be settled as to whether one or more additional applications will result in the same way. It seems to me that this whole matter has not yet reached the point where we will be justified in saying to the public it will be safe to use the crude petroleum. The practical question is not whether an expert can use this as an insecticide with safety, but whether it can be safely trusted in the hands of inexperienced men who are not trained in exactness of methods or quantities. I do not wish to be understood as in the least denying that there may be something in both crude and refined petroleum that may, in the future, have great value as an insecticide, but that, for the present, we should be content with investigations, and be exceedingly cautious in regard to recommendations until we have at least found out the reason for such widely diverse results being obtained from applications so nearly alike in point of materials and methods.

It must be remembered that our experiments with crude petroleum at Wooster, Ohio, were made upon seedling apple trees, which, though they might have possessed different degrees of resistibility, might, on the other hand, have been less susceptible than any of the grafted varieties. The selection of these trees was not a matter of choice, for they were the only ones available at the time. Next year, we shall endeavour to reverse the experiment; that is, where the 10 per cent. mixture was used this year we shall use 100 per cent. next year, and vice versa. A large number of experiments are also to be carried out upon different varieties of apple, in different parts of the State, using different strengths of the crude petroleum.

PETROLEUM DISTILLATIONS.

	A	B
Specific Gravity.....	35°B	34°B
Light Naptha, 80°C.....	1.49%	.14%
Heavy " 80° to 120°C.....	4.35	1.63
Benzine, 120° to 150°C.....	5.03	3.82
Light burning oil, 150° to 200°C.....	7.64	13.48
Heavy burning oil, 200° to 250°C.....	13.54	12.03
Residue from 250° Dist.....	68.70	68.62
	100.74%	99.72

A, from Lodi, Ohio, well. B, from Gypsum, Ohio.

Distillations by J. W. Ames, Asst. Chemist, O.A.E.S.

B contains sulphur compounds.

INJURIOUS INSECTS IN ONTARIO DURING 1900.

BY DR. JAMES FLETCHER, DOMINION ENTOMOLOGIST, OTTAWA.

The practical entomologist has had his hands full during the past season in Ontario. The season has been a most unusual one—hot and dry in some sections, but unusually wet in others. There have not been, however, any very remarkable outbreaks of injurious insects which have been the cause of widespread loss; but some of the old and well known pests have done a considerable amount of harm, much of which could have been prevented if farmers would only recognize that they have every year to reckon with the generally forgotten but always present tax collectors belonging to the insect world and that these always work in the same way. Orchard insects, which could have been controlled by spraying, were neglected in many places, and Cutworms caused losses which could have been prevented. The Pea Weevil, every year abundant and destructive, seems this year to have been more so than usual, but the Destructive Pea Aphis was not so injurious as at one time it was feared it would be. Late in the season it was found that great harm was being done by the Hessian Fly throughout western Ontario, most particularly in early sown wheat. The Turnip Aphis was only locally prevalent. The San José Scale has spread over many orchards which were only slightly affected in the beginning of the season. The so-called Buffalo Moth is becoming a serious pest and is spreading.

CEREALS.

By far the most serious outbreak among cereals was by the HESSIAN FLY (*Cecidomyia destructor*, Say, Fig. 14, highly magnified) in fall wheat. Specimens of young wheat plants infested to a remarkable degree, some of the shoots containing nearly a dozen puparia, were received from Waterford, Ferguson, and other places. Very few reports of injury by the summer brood came to hand, so that this sudden appearance of the insect in such large numbers was somewhat of a surprise. Reports from correspondents show that late sown grain was to a marked degree less infested than that sown at the usual time in the beginning of September. The appearance of the perfect insects,—tiny blackish gnats not expanding more than a quarter of an inch from tip to tip of the outspread wings,—and the life history are so well known that it is not necessary again to go into details here with regard to these; suffice it to say that there are two broods in the year, the perfect flies of the first appearing in May and June, and laying their eggs on the leaves of the growing wheat plant. The small maggots work their way down inside the sheaths of the leaves and attack the tissues of the growing stem, weakening it and frequently causing it to fall down, bending over just above the point of attack. The brown flax-seed-like puparia may frequently be found in straw or under the machine at the time of threshing. Some of these flax seeds the number varying according to the season, produce the flies the same autumn, chiefly in the month of September; these lay their eggs on the newly sown fall wheat. Some of the flies of the summer brood, however, do not emerge until the following spring—at the same time as the flies of the autumn brood—and these lay their eggs on the young plants of spring wheat. This attack is frequently overlooked, owing to the fact that, if the wheat plants are not sufficiently advanced for the eggs to be laid upon the stem leaves, they are laid upon leaves close to the ground and the larvae attack the root shoots and kill them before they have produced stems at all. I find that, as a general thing, there is a great deal more injury done in this way than on the stems of wheat. Farmers, as a rule with this attack, do not recognize their enemy and attribute the thin crop to "cold or wet springs," "late frosts," "hot suns," or other imaginary causes of which no exact record had been kept. As stated above, there is this autumn a very serious attack by the Hessian Fly in our Ontario wheat fields, particularly in those sections where fall wheat is most largely grown. As a matter of fact, fall wheat can be grown in every county of the Province, and the Hessian Fly is liable to occur in any of these. Certain areas, however, from the

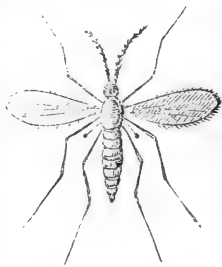


Fig. 14.—Hessian Fly.

satisfactory results are recognized to be particularly well suited for the cultivation of this cereal.

Many experiments by agriculturists have shown that better crops are reaped if the seed is sown early, that is, about the 1st of September. This, however, is only true in such years as the Hessian Fly is not prevalent. Therefore, it is decidedly advisable for growers of fall wheat to remember in such periods as the Hessian Fly is abundant, what the life-history of this insect is, and, instead of trying to sow their fall wheat seed by the 1st of September, delay this operation until after the 20th, being content to get a slightly smaller yield and to be sure of it, than, in the effort to get a bigger crop, perhaps run the risk of losing half or even the whole from the attacks of the Hessian Fly. By postponing seeding until the end of September, the appearance of the young plants above the ground is delayed until after the egg-laying flies of the second brood are dead. Where fall wheat has been sown in August and is already well up, it is considered advisable when the Hessian Fly is known to be prevalent to feed off a good deal of the green top with sheep during the month of September, in which manner it is claimed that many of the eggs are destroyed. Care must be taken that the fields are not cropped too closely nor too late in the season. Late sowing therefore may be claimed to be the most important preventive remedy against the Hessian Fly. There are, however, other methods of reducing the numbers of this insect, among the more important of which are the treatment of stubble and the burning of refuse. The treatment of stubble is of most use in such districts as Manitoba, where there is only one brood of the Hessian Fly, which is restricted to spring-sown grain. In 1899 the Hessian Fly appeared for the first time in Manitoba, where no fall wheat is grown, and did an enormous amount of harm. Fortunately, this year there is no recurrence of this attack. The insect passes the winter in Manitoba, for the most part, in the stubble, although some of the puparia are carried from the field with the straw. Therefore, if stubbles be burnt over or ploughed down deeply in autumn and the straw is fed to stock or burnt at any time before the flies emerge in spring, there being no autumn brood, this pest should not be difficult to control. The burning of refuse which is thrown down beneath the threshing machine, will also dispose of many flax-seeds of the summer brood which did not emerge in the autumn and were carried in the straw. If this refuse were not destroyed, these would give forth their flies the following spring.

In cases where fields are found to be infested with Hessian Fly, it is sometimes difficult to decide what a farmer's wisest course is. If the infestation is only light, it is sometimes possible to stimulate the crop by the use of a light application of some quick acting fertilizer. Where, as is generally the case, there are patches in the field which have been destroyed, it is desirable to save such parts of the field as are uninjured. These patches can be sown in spring to some crop which will not require cultivation, e.g. an early ripening barley, which can be cut at the same time as the fall wheat and the whole threshed as mixed feed. If, however, it is necessary to save the wheat separately, peas may be sown on these patches, which can either be cut after the wheat, or the grain can be separated after threshing. In cases of bad infestation it would sometimes pay better to use the land at once for some other crop.

The usual practice of simply cultivating deeply so as to produce a good seed bed is an improper one, because the flax seeds are present and, if the land is only cultivated, the flies will emerge in spring and prove a source of infestation to the uninjured remainder of the wheat crop and also to any spring wheat or barley which may be sown nearby. Infested areas should be ploughed down deeply so that the flies when they emerge from the flax seeds shall be unable to work their way out. Then any crop may be sown except spring wheat. Barley and rye are also sometimes liable to attack; consequently, other crops are preferable to these, such as oats, peas, corn or roots. There will sometimes be cases where the farmer is uncertain what it is best to do, owing to the occurrence of uninjured patches in an otherwise badly infested field. In these cases it will be best to wait and see how the wheat will turn out. If at last something else has to be substituted as a crop, probably the best returns will be obtained by sowing early ripening corn where a cultivator can be used, or early peas where the patches are surrounded by wheat. Both of these crops may be sown as late even as the middle of June and will give good results. Mr. N. H. Cowdry, a very careful observer,

of Waterford, Ont., has noticed that different varieties of wheat are not injured to the same extent; for instance, in one field of Clawson wheat about eighty per cent. of the plants contained Hessian Fly puparia, while Democrat wheat near at hand was only injured to an extent of thirty per cent. Again, Clawson wheat was as a rule attacked in the upper and earlier sprout which was killed, but an uninjured sprout was growing from the seed. Democrat wheat, on the other hand, showed the original sprout uninjured or to a much less degree than the other variety, and the secondary shoot had not by the end of November so far been produced. Of the two fields the Democrat looked green and healthy, but the Clawson looked yellow and faded, and there was a great deal of rust on the leaves.

A yellow colour so often referred to by farmers as an indication of the presence of Hessian Fly is a sign by no means always to be relied on, for, as Professor Webster, of Ohio, has pointed out, infested plants are for a time of a brighter green and more stocky than those in a healthy condition. However, there are frequently in the autumn enough dead leaves and shoots to give the fields a brown and unhealthy appearance, and these together with leaves attacked by the fungous disease rust, which sometimes, as during the present autumn, is very abundant, may have been the cause of the appearance which is so often described as "yellow from Hessian Fly."

CUTWORMS IN GRAIN.—There have been reports from restricted localities chiefly in the western counties, of injury to grain fields by the larvæ of the amputating brocade moth (*Hadena arctica*, Bdv.) and other cutworms.

WIREWORMS are mentioned in several localities but no specimens have been sent in.

WHITE GRUBS. The larvæ of the June beetles (*Lachnosterna*), (Fig. 15, 3 and 4), have done a good deal of harm not only in pastures but to some field crops in different parts of the province. Notwithstanding the very different appearance of these two kinds of grubs, I find that they are very frequently confounded with each other by farmers. Wireworms (Fig. 19), the larvæ of the Click Beetles (Figs. 16, 17, 18), are slender cylindrical shaped, tough-skinned, bright yellow, grubs, about one inch long by one-eighth of an inch, or less, wide. The two ends of the body are somewhat similar in general appearance; Fig. 20 represents the pupa of a wireworm, upper and under side. White Grubs (Fig. 15, 2) on the other hand, are much

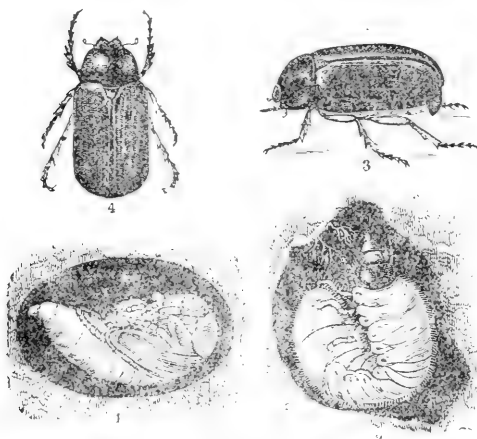


Fig. 15.—White grub: 1. pupa; 2. larva; 3 and 4. June beetle.

larger, heavy-bodied, almost sack-shaped, white grubs with yellow heads having the end of the body enlarged, curved down and brown from their earthy contents showing through the thin skin. If the body were straightened, it would measure an inch and a half or more, by three-eighths of an inch wide at the widest part. The duration of the larval life of these two insects is probably about the same. The eggs of the June beetles are laid in spring, and the young grubs feed all the first summer and through the second one, attacking the roots of all kinds of plants, but being most numerous in fields where there are trees, or round the edges of fields near trees. By the end of the second summer they become full-grown and change to beetles, but do not emerge until the spring of the third year. Wireworms begin their lives much less regularly at any certain time of the year; the perfect beetles belong to a very large number of genera and species, which occur through the season, and the eggs



Fig. 16.

Fig. 17.

Fig. 18.



Fig. 19.—A Wireworm.

of some kinds may be laid at any time. The food of wireworms has a much larger range than is the case with the white grubs, many, and these are the most injurious species, feed upon the roots of grain and other crops, grass, shrubs and trees. Some feed on decaying wood and other vegetable matter, and some, at any rate occasionally, are even predaceous. On the whole, however, the class must be considered as decidedly injurious. In the beetle state Click-beetles (Fig. 21) are not considered very destructive but one species, *Corymbites tarsalis*, Melsh., has of late years been detected as a rather frequent enemy of the apple, feeding in the flowers and destroying the essential organs, and also eating the young foliage. As

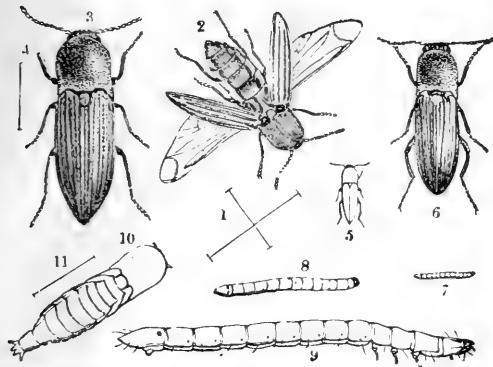


Fig. 21.—Click-beetles and Wireworms—2, 3, 6, 9, 11, magnified.

a general remedy for both of the above named classes of insects, late ploughing has been found beneficial, by breaking up the pupal cells at the time the insect is in a tender condition and exposing it to many dangers when it is either a pupa or an immature beetle, and unable to make another cell. The trapping of the mature Click-beetles by using pieces of potato poisoned with Paris green placed on the ground near where the beetles seem to be abundant is claimed by some experimenters to have been attended with considerable success. The June beetles are largely foliage eaters and are specially attracted to certain kinds of trees. Many may be destroyed by spraying these attractive trees with Paris green and lime, which may be applied as strongly as one pound of Paris green with two pounds of lime in 100 gallons of water.

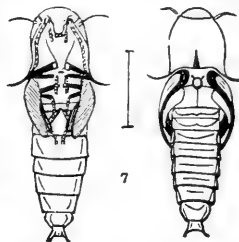


Fig. 20.—Pupa of Click-beetle.

THE PEA WEEVIL (*Bruchus pisorum*, L., Fig 22).—Year after year, the loss in the pea crop from that old and well known enemy, the Pea Weevil, is simply appalling.

The life history is well known and it must be claimed that the remedy is practical, that is, effective, cheap and easy, and yet it is not applied regularly by pea growers as it ought to be. As far as I can learn, the large seed merchants and the large growers do fumigate their pease with bisulphide of carbon and destroy the contained insects. The trouble seems to be with the small growers and farmers who save a few bushels for seed and do not take the trouble to treat these small quantities. As is well known, the Pea



Fig. 22.—Pea Weevil—greatly enlarged, and of natural size.

Weevil comes to maturity in autumn and if the season is favorable emerges at that time of the year and passes the winter under rubbish and in out-buildings. Many, however, remain in the pease and do not emerge until the following spring, when they are frequently sown with the seed. The perfect insects are very active little beetles which fly easily to the pea fields about the time the blossoms appear. They feed for some time on the flowers and leaves. As soon as the young pods are formed, the females lay their eggs upon them, from which the grubs hatch and eat their way into the pod and penetrate the forming seeds.

Remedies: The best remedies for this insect are the treatment of the seed with bisulphide of carbon, late sowing and the holding over of seed. Fumigating with bisulphide of carbon is the method now generally adopted by seed merchants and most of them have special houses for "bugging pease." Farmers can easily make use of this same method by taking an ordinary 45 gallon coal oil barrel which will hold five bushels of pease. According to the quantity of seed to be treated, one ounce of bisulphide is used to every 100 pounds of pease, that is three ounces if the barrel is filled. The chemical may be either placed in a flat open basin on the top, or it may be poured

directly on to the grain. The top of the barrel must be quickly replaced and covered up with cloths, etc., as tightly as possible. This treatment should be carried on in a shed out of doors, and the barrel must not be opened for 48 hours. Bisulphide of carbon is a colourless malodorous liquid which volatilizes readily at ordinary temperatures. The vapour is quite invisible, but being heavier than air it sinks readily and permeates the contents of the barrel. It is very inflammable and care must be taken when using it that no light of any kind is brought near. This treatment should be done in the autumn as soon as possible after the pease are threshed and before the weather has become cold. The sooner the treatment is done, the less injury the weevils will have done to the seeds, and, if the bisulphide is not used until cold weather has set in, its effect upon the insects is very much less than when they are in an active condition. Moreover, by delaying treatment there is the risk in mild autumns that the beetles may have attained full growth and left the seeds. The late sowing of peas is useful in preventing attack by weevil, but the method is not in favour with farmers because late sown peas in certain seasons are liable to be so much attacked by mildew as to reduce the crop sometimes more than would be done by the weevil. The holding over of pease until the second year, keeping them in close bags to prevent the escape of the beetles, is certainly a good remedy and is not practised by those who use small quantities of seed as much as it ought to be. The reduction of vitality of seed pease held over for one year is very little indeed. Unlike the Bean Weevil, the Pea Weevil cannot propagate in the dry seed so that every beetle which emerges dies inside the sacks. Before sowing, the injured seeds must be separated and only those which are perfect planted.

THE PEA MOTH (*Semasia nigricana*, Steph., Fig. 23).—In the eastern counties of Ontario and extending down through Quebec into the Maritime Provinces, much harm has been done by the caterpillars of the Pea Moth. They have been particularly abundant at Ottawa this year in late peas. As this insect resembles the Codling Moth very much in its methods of attack, some experiments were tried at my request by Mr. J. E. Wetmore, of Clifton, N.B., by spraying the vines when the young pods were forming with a Paris green mixture which had been rendered adhesive by the addition of whale-oil soap. The results from these experiments, although not conclusive, are of a hopeful character and will form the basis of further experiments next year.

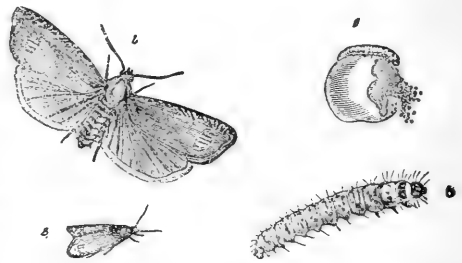


Fig. 23.—The Pea Moth—natural size and enlarged.

THE DESTRUCTIVE PEA APHIS (*Nectarophora destructor*, Jnsn.).—This insect which was the cause of such extensive injury to the pea crop last year not only in the southern States but extending further north into Canada, has this year not been so bad as in 1899 but still has caused considerable loss. In the eastern counties the larger number of attacks have been noticed. The J. H. Allan Seed Company, of Picton, reports that "this season it has done considerable damage in New York State, Michigan and Wisconsin. Last season as well as this it caused injury in Prince Edward County as well as in Lennox and Addington. We are also told that it did much damage in Renfrew County." Last year in the State of Maryland the loss from this insect was put at \$3,000,000, and during the past summer the loss in the same crop much exceeded that amount. Moreover, not only did this insect attack the pea crop but it was found to be much more distinctively an enemy of clover. This attack upon clover was not serious in Canada, and at Ottawa, where plots of peas were entirely destroyed by it, clover plots closely contiguous showed no sign of the presence of the aphis until very late in the season, when all peas had been killed by frost (November), and when a few were found. Many remedies were experimented with by Prof. Johnson, State Entomologist of Maryland, the describer of the species, and it was found that what has been called "the brush and cultivator method" was the most effective. For this it is necessary that the peas should be sowed in rows from 24 to 30 inches apart, and not broadcasted. He says, "The vines were brushed backward and forward with a good pine switch ahead of an Iron Age cultivator, which was drawn by one horse, and in this manner the insects which leave the vines freely when

these are shaken were covered up and a large proportion of them destroyed." The cultivation was not repeated until the third day, as it usually required 48 hours to destroy the insects when covered with earth. Another method which was tried with considerable success, consisted of a brush which dislodged the insects so that they fell into a pan containing coal oil and water, and dragged between the rows. In this way a bushel of plant lice were caught to each row of peas 125 rods long. Spraying was tested, but it was abandoned because no spray could be found which would destroy a large enough percentage of the insects to warrant the expense of the operation. An extensive experiment, however, covering 600 acres where the plants were brushed and cultivated every third day for a period of two weeks, forty men being employed, was very successful. In this manner the entire field was saved, netting the owner from 25,000 to 30,000 cases of peas of two dozen tins each. It is also stated that a field not far distant where nothing was done, was totally ruined. As is usually the case with all kinds of plant lice when they occur in excessive numbers, the Destructive Pea Aphis has been vigorously attacked by many kinds of parasites, which at Ottawa, at any rate, have had a remarkable effect in reducing its numbers. Although the plant lice were extremely abundant in some places, they were almost totally wiped out on one or two occasions by certain of these enemies. The most useful parasite at Ottawa was a small dipterous fly, probably of the genus *Diplosis*. The small orange maggots of about a sixteenth of an inch in length crawled about among the colonies of plant lice and destroyed them in large numbers, piercing their bodies with their mouth parts and sucking out their juices in the same manner as is done by the larvæ of *Syrphus* flies. When full-grown these larvæ spin a small close cocoon either in the angles of the leaves or stem, or falling to the ground make a cocoon of silk with particles of sand attached. There were continuous broods of this useful parasite throughout the season, and the minute gray midges could be seen about the infested plants at all times. The last brood spun their cocoons in the middle of October, and the larvæ will remain in them until next spring. Several species of lady-bird beetles, *Syrphus* flies and lace-winged flies were also abundant, as well as species belonging to the hymenopterous genera *Praon* and *Aphidius*. The first of these emerges from its host and spins a cocoon beneath the dead body. The latter passes through all its stages inside the body of the plant-louse and when mature eats its way out through a circular hole.

FODDER CROPS.

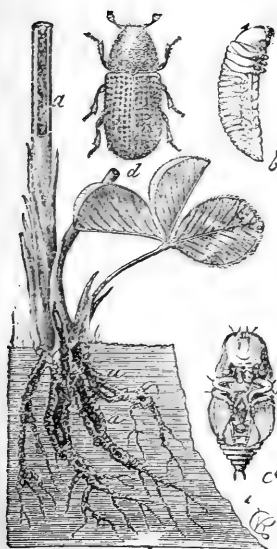


Fig. 24.—Clover Root-borer.

THE CLOVER ROOT-BORER (*Hylastinus obscurus*, Marsh = *Hylesinus trifolii*, Muell., Fig. 24).—The Clover Root-borer generally occurs in a few localities in Canada every year, but is seldom the cause of much harm and this will be more and more the case not only with this species, but with the Large Clover Weevil (*Phytonomus punctatus*), as farmers get more into the way of sowing clover to a larger extent as a green fertilizer and plough it down after the first crop. During the past summer the Clover Root-borer was observed doing some harm in old fields of clover but also in some new ones right across the province. The worst occurrences were near London, at Picton and in a small patch at Ottawa. Clover which is infested flowers irregularly and the plants have an unhealthy appearance. The insect may be found in autumn in all stages in the roots of clover plants; the beetle comes to full growth late in autumn and remains in its burrows until the following spring. The remedy for this insect is a short rotation. The value of clover as a fertilizer is now so well known that farmers do not hesitate to plough down their meadows as soon as they find traces of this insect. This should be done as soon as there is a pretty good growth on the ground after the first crop of hay has been removed.

The LARGE CLOVER WEEVIL (*Phytonomus punctatus*, Fab.) was found to be abundant in the larval condition in a field, near Picton, Ont., which

was also infested by the Clover Root-borer. These larvæ, however, were almost all attacked by the fungus *Entomophthora phytonomi*, Arthur. Almost every blade of grass rising above the clover had at its tip a dead or moribund larva, and of a large number which were apparently healthy, collected for rearing, there was hardly a specimen which produced the beetle. The diseased grubs were of all sizes from very small to full-grown. This was on the 24th of May. A few of the full-grown larvæ taken at that time spun their lace-like cocoons in the beginning of June and two beetles emerged about the end of the month. The beetles measure over four-tenths of an inch in length, are oval in shape and of a brown colour with four pale punctured lines on the sides. The beak is rather short and blunt, the thorax smooth and swollen with three pale lines. The wing cases each bear ten deeply impressed lines of punctures, from which the species takes its name.

ROOTS AND VEGETABLES.

A great number of insects have been complained of during the past season as having attacked more or less root crops and vegetables. Some of the more important of these are the following :

CUTWORMS—The Spotted Outworm, as the larva of *Noctua C-nigrum*, L, Fig. 25, has been inappropriately called, was extremely abundant in many localities along the north shore of Lake Ontario, injuring all kinds of garden and root crops. This is never a rare insect, but this year it was enormously abundant. The brood of which larvæ are found during July, was the one this year which did most harm. This species seemed to take the place in Ontario and resembled very much in its habits and time of appearance, the Variegated Out-worm, *Peridroma saucia*, of which there has been a disastrous outbreak this summer all through the Province of British Columbia. The larva of *Noctua C-nigrum* is grey or pale brownish of varying shades. When full-grown it is nearly an inch and three-quarters long, rather slender, being less than a quarter of an inch at its widest part. The markings are difficult to describe, and vary very much in intensity. There is always a pinkish sub-stigmatal stripe, and the whole of the dorsal area is more or less crossed and darkened by indistinct blackish blotches or mottlings, which on each segment on the dorsum take somewhat the shape of the letter "M" with the top pointing towards the anal end. In some specimens there is a supra-lateral row of spots on each side gradually increasing towards the anal end both in size and intensity of velvety black. On the last segments these are elongated angular blotches with the apex pointing forward. There is also a narrow medio-dorsal pale line and a pale lateral line on each side. However, no two specimens agree exactly in ornamentation, but all have the appearance of being covered with a coarse network of black more or less obsolete over a pale brown ground colour. The moths appeared in large numbers from July till the end of the season and it is most probable that the eggs are laid in late summer and autumn and that the larvæ hibernate half-grown.



Fig. 25.—Moth of Spotted Cutworm.

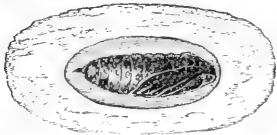


Fig. 26.—Variegated Cutworm: pupa.

The Variegated Out-worm (*Peridroma saucia* Hbn.) was also found in considerable numbers, the large caterpillars nearly two inches long by over a quarter of an inch wide, attacking all garden plants and also doing harm in orchards upon apple trees. Some pupæ of this species (Fig. 26) with the moths ready to emerge were found at Ottawa in the beginning of

November, but the weather changed immediately afterwards,

and it is hardly likely that the whole of this brood produced moths before winter set in. The life history of this species in Canada as to hibernation is not definitely known from actual observation, but from the above incident it would appear as if moths which emerge in July and August, must lay their eggs (Fig. 27) and the larvæ hibernate partially grown. Moths which emerge in October and November probably pass the winter in that condition, and it would also appear as if some must remain in pupa until the following spring.

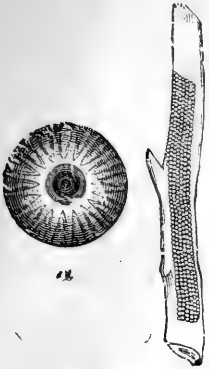


FIG. 27. — Variegated Cutworm: a, single egg, highly magnified; egg cluster on twig.

The remedies for cutworms which have given the best results are the banding of freshly set out annual plants, either with rings of paper or tin, so that this protection extends down about an inch beneath the surface of the soil and an inch and a half or two inches above it. Faded leaves which hang down and touch the ground must be cut off. This protection is particularly applicable for cabbages, tomatoes and tobacco. For clearing infested land either just before planting or when a crop is found to be attacked, the now well known mixture of bran and Paris green gives excellent results. This mixture may be applied either wet or dry. In the latter method the bran should be slightly dampened with water containing 2 or 3 ounces of sugar to the gallon of water. After mixing thoroughly so that the whole mass may be slightly moist, but at the same time feel dry to the touch, dust over it a sufficient quantity of Paris green, green arsenoid, or some other similar poison, to give the mixture a slightly green colour. In the former recommendations it was advised to add the Paris green to the bran in a dry condition; but this is not satisfactory, because on account of the weight of this poison it sinks at once to the bottom when stirred. The bran or meal mixture

should be sufficiently dry to run through the fingers easily. It should then be placed in small heaps a few feet apart where the cutworms are thickest and will be greedily eaten by these insects. This is merely a modification of Prof. Riley's trap remedy which has been used successfully for many years. This consists of tying up in small bundles any green succulent vegetation such as any luxuriant weed which may be growing by roadsides, and after dipping them in a strong mixture of Paris green and water, distribute them over the land or along the rows of a crop. The greatest drawback to this method of fighting cutworms is the fading of the plant used. This may be prevented to a certain extent by placing a shingle on the top of each, which has the double advantage of attracting the cutworms as a hiding place, and of preventing evaporation from the bundles. It is seldom that plants attacked by cutworms can be treated successfully by spraying, except in the case of climbing cutworms in orchards.

CABBAGE WORMS—The cabbage crop during the past season has suffered from several enemies. The root maggots caused great havoc in many places among cauliflowers and early cabbages. The Diamond-back Moth (*Plutella cruciferarum*, Zell) was abundant and destructive in dry districts to cabbages, turnips and rape, but the worst enemy of the cabbage crop this year was the White Cabbage Butterfly (*Pieris rapae*, L.), the green caterpillars of which were so numerous from Peterborough westward almost to Hamilton and also at Ottawa and other places, as to reduce seriously the crop of turnips which, owing to the leaves being destroyed, could not "bulb." Cabbages in fields and gardens were also seriously injured. There are always every year certain insects which are liable to increase and do harm, but the Cabbage Butterfly is one which may be treated with comparative ease. The caterpillars are particularly susceptible to the effects of pyrethrum insect powder, and, if a mixture be made of one pound of this powder with four pounds of cheap flour and the whole be kept for twenty-four hours in a tightly closed jar or canister, and then dusted over the plants, it will kill all of the caterpillars upon which it falls, without injury to the plants and without danger to those who consume them. The proprietary mixture known as Slug Shot has also proved very deadly against "cabbage worms," as these caterpillars are generally called, but this must only be used early in the season while the plants are small, as it contains poison. This insect was probably more abundant during the past season than it has ever been noticed before, but toward the end of the summer it was destroyed in enormous numbers by an epidemic bacterial disease. Caterpillars which were attacked, first assumed a pallid or bluish white appearance and then gradually turned brown in blotches which enlarged until the whole body was a putrid mass. This disease was at its height in the beginning of September and continued to the end of the season. The spread of the White Cabbage Butterfly has been very rapid. It is said to have been imported into America first at Quebec about 1858, from which point it has spread in every direction. Although it had reached the Pacific coast in the United States some years ago, it is only during the past summer that it has appeared as an enemy of the cabbage grower on the coast in British Columbia.

The first record for that province was by Mr. J. W. Cockle who found it at Kaslo in the Kootenay district last year.

The DIAMOND-BACK MOTH (*Plutella cruciferarum*, Zell.) seldom does very much harm in Ontario but in the West it is terribly destructive to all crops belonging to the Cabbage family, and, owing to the fact that the caterpillars feed almost entirely beneath the leaves, it is extremely difficult to apply an effective remedy. The best results have been obtained with dry powdery mixtures containing poison, blown between the leaves by means of agricultural bellows and insect guns. For this purpose, a strong mixture of one pound of Paris green in 25 pounds of air-slaked lime, or perfectly dry flour, gave good results. If liquid applications are used, a sufficient quantity of soap must be added to make them adhere to the foliage of such plants as turnips and cabbages, and a nozzle on an angled support must be used so as to throw the spray well up under the leaves. A knapsack sprayer with a cyclone nozzle answers well for this purpose.

The ROOT MAGGOTS (*Anthomyidae*).—These troublesome insects have as usual done a great deal of harm and many experiments have been tried to secure a practical remedy. Unfortunately no very good results have been obtained. Onions, cabbages of all kinds, beans, corn and radishes have suffered. Mixtures containing carbolic acid in some form seem to be the most hopeful. Whale-oil soap gave tolerably good results. The most satisfactory experiments were with early cauliflowers which were protected to a large extent by means of the Gough Tar-paper Discs. These consist of a disk of ordinary tarred building felt with a split from the margin to the centre so as to allow of their being placed around the stems of newly planted cauliflowers. The odour of the tarred paper preventing the flies from laying their eggs, and the tarred paper disc also had the effect of holding moisture around the roots and inducing a copious growth of young rootlets, which were of great service in helping lightly attacked plants to outgrow the injury.

ASPARAGUS BEETLES.—The two species of Asparagus Beetles which were mentioned in our last report are still present in the Niagara district and together with the Asparagus Rust have done a certain amount of harm. Fig. 28 represents *Crinoceris asparagi*, L, eggs on plant, larva and beetle. They have not, however, spread through the district to the same extent as it was thought they would last season, judging from their sudden appearance in the country in such large numbers. Asparagus growers seem to have grasped the idea of fighting them as larvæ, and a great many beds were dusted regularly with fresh lime when the larvæ were upon them. This seems to have been the remedy which was most used.

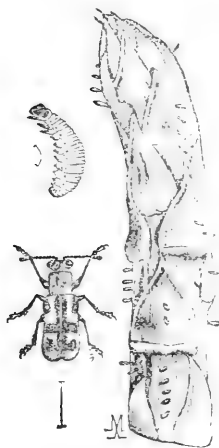


Fig. 28.

and left in the fields it would be well to plough them down deeply, so that the young plant-lice when they hatch in spring would be unable to get out. It would of course be well also to avoid planting a crop of the Cabbage or Turnip family on the same land the following year.

TURNIP APHIS (*Aphis brassicæ*, L.).—There has been a decided absence of the Turnip Aphis in most parts of the Province during the season of 1900, except up in the north-western counties. In some places in Huron County the loss has amounted to about half or more of the crop. The eggs for this species are laid in large quantities on the old leaves of the turnips, and where these are cut from the plants

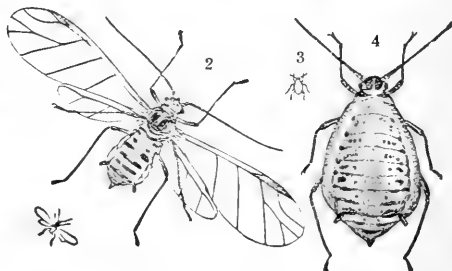


Fig. 29.—Turnip Aphis.

FRUITS.

The large amount of attention which has been devoted to fruit trees and orchard pests consequent upon the accidental introduction into Canada of the San José Scale, which is discussed fully in another part of this Report, has had a decidedly good effect in stirring up fruit growers to attend more carefully to their orchards. Spraying has been more regularly and generally done for leaf-eating insects and Codling Moth. Late fall

and early spring applications have been made for scale insects and all the operations of the orchard seem to be better attended to than was formerly the case. Fruit growers are learning the habits of many of their regular pests, and there is a much greater demand for information about injurious insects than was the case only a year or two ago.

The OODLING MOTH and PLUM CURCULIO do not seem to have been so destructive, judging from reports received, as usual. The TENT CATERpillARS which have been so abundant all through the Dominion were decided less destructive last spring. The Eye-

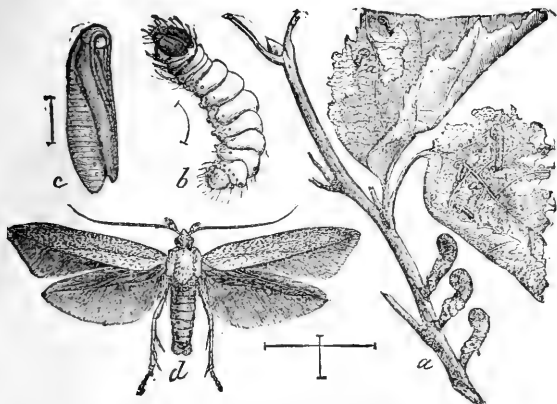


Fig. 30.—Apple Pistol Case-borer.

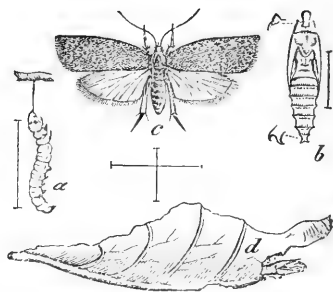


Fig. 31.—Apple Leaf-Roller (*Teras minuta*, var. *cinderella*).

spotted Bud moth and Oblique-banded Leaf-roller did their share of mischief, and early spring insects were rather more than usually troublesome along the shores of Lake Ontario. The Cigar Case-bearer, the Apple Pistol Case-bearer (Fig. 30) and leaf-rollers (Fig. 31) were about equally abundant and where neglected did harm. The species of leaf-roller which seemed to do the most harm was *Lophoderus quadrifasciana*, Fern. From Hamilton larvæ of the PALMER WORM (*Ypsolophus pometellus*, Harr.) were sent at the end of June, and a little later the same thing was sent in from Oakville. This is rather an unusual pest in Canada



Fig. 32.—The Basswood Looper.

western Ontario, especially in the Niagara district, an interesting little moth, the larva

and had attracted attention from the extreme activity of the caterpillars. The ROSE CHAFER was reported as troublesome on apple trees at Niagara and Grimsby, and the CLOVER MITE did considerable harm to fruit trees all through the western counties where it was generally reported as "Red Spider." CANKERWORMS were destructive in restricted localities during May and early June. The species of which specimens were sent in, proved to be the Fall Cankerworm. The BASSWOOD LOOPER (*Hybernia tiliaria*, Harr.) Fig. 32 was particularly abundant in the Ottawa district, attacking not only apple trees but various forest trees, especially the maple, elm and basswood. In

of which mines in apple leaves and sometimes does rather noticeable injury when abundant, is *Nepticula pomivorella*, Pack. The larva when full-grown leaves its mines in the foliage and spins small scale-like brown cocoons on the twigs where it passes the winter. This insect was formerly placed in the genus *Micropteryx* but it has been discovered by Mr. Busck of Washington that it is a true *Nepticula*.

Pear trees have suffered rather more than usual from three of their enemies. The Cherry Slug in some places has stripped the green cellular parts from the foliage to such an extent as to render the leaves quite useless to the trees, and as a consequence the fruit was ruined. This insect can be very easily kept in check either by spraying with arsenical poisons or by dusting constantly with freshly slaked lime. The Pear Psylla was particularly troublesome at Freeman, near Hamilton, and through the western counties. Mr. Geo. E. Fisher considers this an insect which requires much more attention than up to the present it has received. The mature insect hibernates beneath the flakes of bark on the trunks and larger limbs and can be destroyed during the winter by a 30 per cent. mechanical mixture of crude petroleum and water, or by the ordinary kerosene emulsion. The Pear-leaf Blister-mite is not quite as bad as it was a year or two ago but still is much more abundant than is good for the pear trees or the pocket-book of the fruit grower. On the Pacific Coast this insect is kept well in check with the lime, sulphur and salt mixture. This mixture has not been used very much in Ontario but the well-known kerosene emulsion sprayed over the infested trees just as the buds are bursting has been found very effective. Doubtless the mixtures of crude petroleum and water which are now coming so much into use will be found very effective against the Pear-leaf Blister-mite as soon as the proper portion to use with safety has been discovered.

INSECTS OF THE SEASON OF 1900.

BY PROF. W. LOCHHEAD, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

In looking backward over the entire season of 1900 it would appear that insect pests were more numerous and produced greater losses than usual. It is very difficult to determine the exact causes which were operating to produce the results, and valuable indeed would be trustworthy observations along this line. Perhaps the dryness of the season which prevented serious outbreaks of fungous diseases operated on behalf of the insects; perhaps the mildness of last winter enabled many more forms than usual to pass through the dormant season; perhaps parasites were not so numerous as usual; but whether there was one cause or a combination of causes the number of injurious insects was on the increase during the past season. Mention will be made of a few of the most injurious forms brought to the writer's attention chiefly by farmers and others in correspondence with the Biological Department of the Ontario Agricultural College.

ORCHARD INSECTS.

THE FRUIT BARK-BEETLE (*Scolytus rugulosus*). Complaints have reached us from Kingsville regarding the injuries done by this beetle. It attacks especially plum trees, and many of Mr. J. D. Wigle's trees died from the injuries. It is probable that trees in other sections are likewise affected, and watchfulness is required to prevent surrounding trees from becoming infested. From breeding experiments carried on at the College the writer finds that the adults appear about the middle of May. They bore holes through the bark into the wood, and proceed to make burrows in which to deposit eggs. The young grubs also make burrows, and within a month the beetles appear. Several broods may appear in a season so that the trunk soon becomes honey-combed with tunnels and dies. See Fig. 3 (on page 35) which represents the work of an allied species (*S. destructor*).

Badly infested trees should be cut down and burned, while those but slightly infested should be sprayed with whitewash, or with a mixture of whale-oil soap and carbolic acid.

THE SAN JOSE SCALE (*Aspidiotus perniciosus*). This pernicious scale is still with us in abundance, and in spite of the treatment of last spring it is just as numerous as it was last fall. Many new infestations have also been discovered, so that the whole problem of treatment will have to be taken up anew. Mr. Fisher, Chief Inspector, considers crude petroleum more effective than whale-oil soap in killing the scale, but Prof. Webster, of Ohio, maintains that crude petroleum is too dangerous a remedy to put in the hands of the ordinary fruit-grower, and accordingly prefers whale-oil soap. The scale is here to stay and the sooner the orchardist recognizes this fact, and the need of effective treatment to keep it in check the better will it be for the fruit industry of the Province. A great industry is at stake. Can we afford to lose this great industry?

GARDEN INSECTS.

THE BEAN FLY. (*Anthomyia radicum*).—In June many complaints reached the office regarding the attacks of grubs on beans in Lambton County. One correspondent wrote that hundreds of acres of beans were being destroyed. Many of the beans did not germinate at all, due to the fact that the maggot ate the interior of the seed, and many of the stems never developed leaves through the destruction of the central portion of the stem. Figure 33 shows very well the nature of the work of the maggot both in the seed and the stem. The maggots are about one-fifth inch long and yellowish-white in color. They taper to a point in front and broaden out behind. After feeding for a while the maggots descend into the ground, and change into barrel-shaped pupae. A week or ten days later the flies emerge from the pupa cases and proceed to mate and deposit eggs. After June no further complaint was made, although many growers had replanted their fields. No remedies could be suggested beyond replanting as early as possible, and not as deep as usual. It is just probable that the deep planting of the seed beans was the direct cause of the injury by the maggots, for the usual food of these creatures is decaying matter. The beans began to show signs of decay, and the maggots took kindly to their new food-supply.

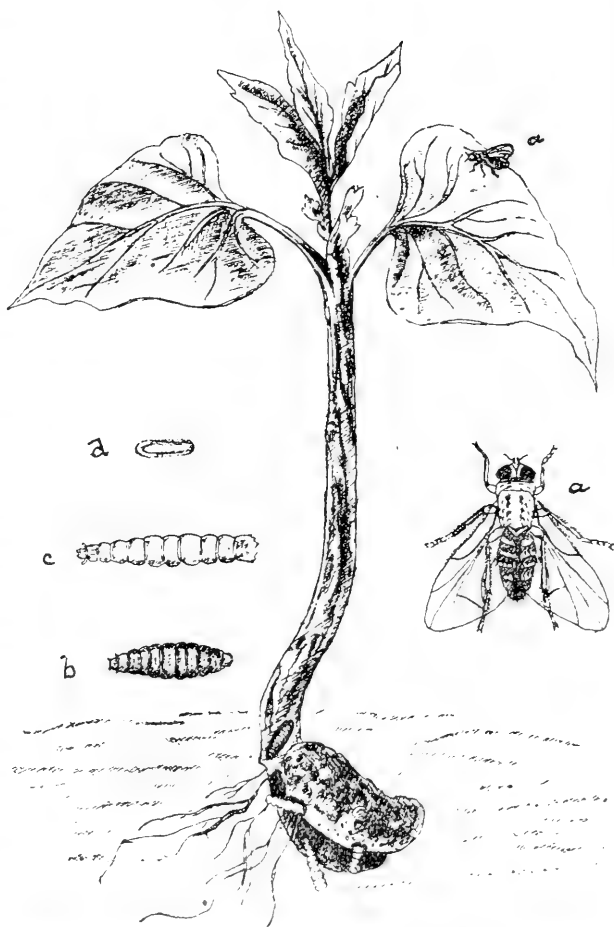


Fig. 33.—The Bean Fly—(a) adult flies; (b) pupa case in ground; (c) maggot; (d) an egg. (After Luggler).

CUTWORMS. (*Noctua c-nigrum*, *Peridroma saucia*, and others.) These night-intruders worked considerable damage in gardens and fields during June and July, but the spreading broadcast of handfuls of bran mash, poisoned with Paris green and sweetened with a little sugar, generally put a stop to their depredations in gardens. The most common forms sent in for identification were the Variegated Cutworm (*Peridromia saucia*), and The Spotted Cutworm, (*Noctua c-nigrum*).

ASPARAGUS BEETLES. (*Crioceris asparagi*, Fig. 34, and *C. 12-punctatus*).—Mr. W. N. Hutt, B. S. A., of Southend, reports to me that *C. asparagi* appeared very early, just as the first young shoots of asparagus were pushing through, and were three or four times as numerous as last year. The *C. 12-punctata* appeared two weeks later than the common species, and were even more numerous. The Department sent out a circular in early spring to the newspapers of the Niagara District, which explained clearly the methods to be adopted in combatting the asparagus beetles, but it would seem as if many gardeners failed to pay much heed to the instructions.

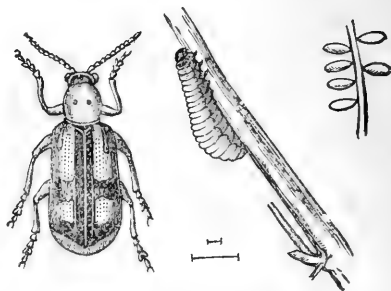


Fig 34.

The westward progress of these beetles has not been very noticeable this year, for although abundant around St. Catharines and Niagara, they have not been observed at Grimsby or Winona. Mr. Johnston reports them, however, from Bartonville, which lies between Winona and Hamilton.

THE BUMBLE FLOWER-BEETLE (*Euphoria inda*). Fig. 35. This beetle was very common in September and did considerable damage by eating holes in pears and tomatoes. Although the beetles occur in sufficient numbers occasionally to do considerable damage, yet this visitation is but periodical. Recent observations at Washington show that this insect is injurious only in the adult state, and that the grub feeds on manure and humus.



Fig 35.

The beetles hibernate, and eggs are laid in the early part of May, and the grubs mature in about two months. The pupa stage lasts about 16 days. The beetle is readily recognized by its triangular thorax, the yellowish-brown wing-covers mottled with black markings, and the grayish pubescence on the under surface of the body and on the legs and thorax.

The only practicable remedy is to collect these beetles.

FARM INSECTS.

THE HESSIAN FLY (*Cecidomyia destructor*). The most serious insect pest of farm crops during the past season was the Hessian Fly, which destroyed the wheat crop in many sections. So far as we are acquainted with the conditions surrounding this pest, it is safe to say that the most available remedy is LATE SOWING. Wheat sown as late as the last week in September has been found unaffected, while that sown before was affected. It is evident that farmers as a rule do not make any serious attempt to carry out the recommendations of practical entomologists in the matter of late sowing, trap crops, or uniformity in time of sowing.

The writer urges that this question, a most important one for the Province, be taken up by the Government, and extensive experiments be carried on in various sections to determine the most favorable conditions for sowing to avoid attack. These conditions have not yet been determined for Ontario.

Among the other serious insects infesting farm crops this past season were *Cutworms* which were abundant in root crops, and even in wheat fields (according to some correspondents). The more common species were the *Variegated Cutworm* (*Peridroma saucia*), the *Spotted Cutworm* (*Noctua c-nigrum*), and the *Glassy Cutworm* (*Hadena devastatrix*). The use of poisoned bran mashes has been found very beneficial in those cases where the remedy is practicable. A knowledge of the life history is often necessary to know the best time to sow grain to escape the cutworm.

The *Pea-weevil* and the *Pea-aphis* have made the growing of peas an uncertain crop in many localities. There is a practicable remedy for the weevil in the use of carbon bisulphide, or in the holding over of the seed peas for another season, when the weevils will have disappeared and the good seeds can be picked out. With regard to the *Pea-aphis*, should it become destructive it will be necessary for the pea grower to change his method of cultivation, and adopt drill planting, instead of planting broadcast as is done at the present time.

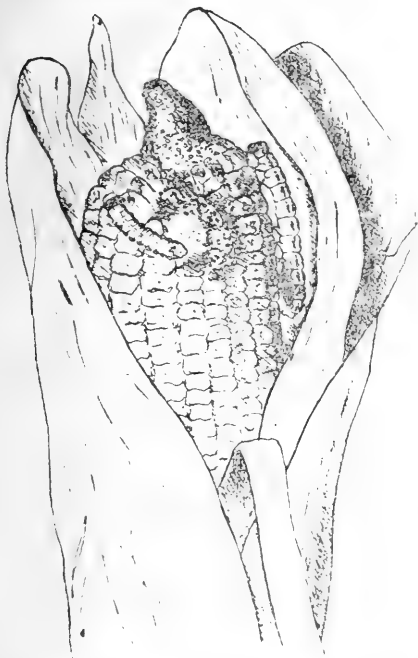


Fig. 36. An Ear of Corn affected by Corn-Worm; Caterpillars are very variable in their markings. (Original).

region lying to the east of Toronto. "Thousands of these winged insects could be seen flying over turnip fields." Although parasites are usually very abundant, it will not do to leave the work of extermination to them alone. A good practicable method of killing the cabbage-worms on small areas especially is to dust a mixture of one pound of insect powder and five pounds of flour through a cheese-cloth bag upon the infested plants.

THE CORN WORM (*Heliothis armiger*). Fig. 36. This worm has been more numerous this season than usual, and appears to find Ontario conditions quite congenial. The green corn offered for sale in the Guelph market was frequently injured by the worm, and the Experimental Department of the College Farm found many ears badly injured at time of harvesting. The Trent Valley Canning Co. of Trenton reported on October 1st, that they had received a few loads of sweet corn containing many badly injured ears; and that in one locality from which they received corn the worm was very prevalent.

Observations point to the view that the Corn-worm is single brooded with us, but it may be double-brooded in some of the southern localities. Late fall-plowing will do much to break up the cells in which the pupae winter, thus causing the death of the pupae.

GRASSHOPPERS were abundant in late summer, not only in meadows and cultivated fields, but also in gardens where tomatoes, cabbage, celery, and other vegetables were often destroyed. Very likely the dryness of the season and the absence of frost were important factors which contributed to their abundance.

THE CABBAGE BUTTERFLY (*Pieris rapae*). This insect was more abundant than usual in cabbage and turnip fields, especially in the

NATURE STUDY LESSONS ON THE SQUASH BUG (*ANASA TRISTIS*).

BY PROF. W. LOCHHEAD, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

INTRODUCTION. That a great awakening in the study of nature is in progress must be evident to every person who is watching the signs of the times. Both parents and teachers are demanding the introduction of nature-study into the daily course of the school, and scholars are becoming earnest nature seekers and observers.

The last Annual Report contained Nature-study Lessons on the Cabbage Butterfly, written in response to a desire for information about this common insect by several teachers who had been induced to introduce object lessons of such a nature into their schools. It appears that the lessons were helpful to many teachers, for frequent requests were made for the article during the past year. Believing that an information-article on some other common insect would be acceptable, the writer ventures again to outline a few lessons on the common Squash Bug of our cucumber and melon patches.

Who has not seen the dull, smoky-brown insect or bug which hides under the wilted leaves of squash and cucumber in late summer? Or who has not thrown the bug down in disgust when the penetrating foul odour reached his nostrils? In the dead of winter one frequently comes across these bugs in crevices and corners of outbuildings and sheds, where they live in a torpid condition far into the warm weather of the next season. If outbuildings are not to be found the Squash Bugs hide under rubbish, bark and chips, which are usually present in carelessly kept gardens.

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When one can examine these bugs in spite of the offensiveness of the odour, many characteristic features will be revealed. The three pairs of legs, the two pairs of dark wings, a pair of feelers or antennæ, and the three divisions into head, thorax and abdomen (fig. 37, f) can be readily distinguished, and the thoughtful student will see at once that so far as the major characters are concerned the Squash Bug is similar to the Cabbage Butterfly. It is only when the minor characters,

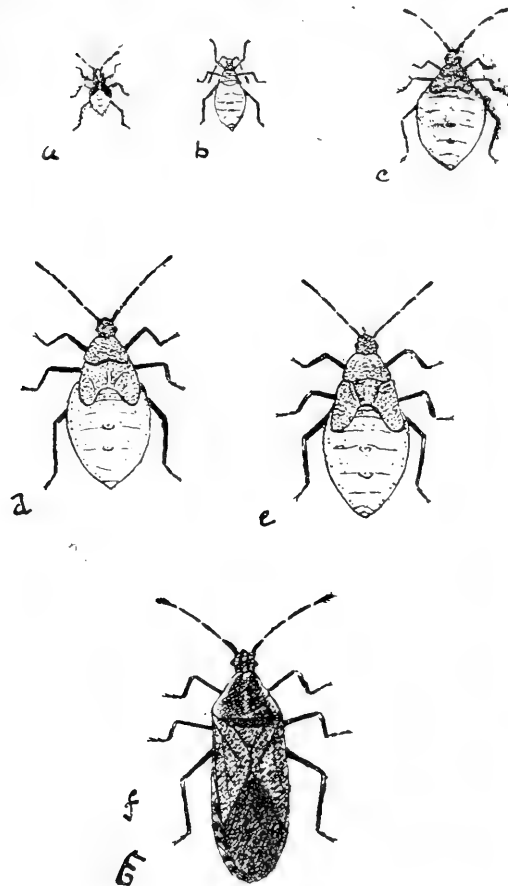


Fig. 37. The development of the Squash Bug. (a) The bug soon after it escapes from the egg; (b) the bug after the first moult; (c) the bug after the second moult; (d) the bug after the third moult; (e) the bug after the fourth moult; and (f) the adult bug after the fifth moult. (Original.)

such as the texture of the wings, the shape of the mouth parts, and the size of the feelers and legs are considered that differences sufficient for classification purposes are seen.

COLOUR.—As to colour the adult winged squash bug is rusty-black, or smoky-brown above, and ochre-yellow below. If a magnifying glass be used it can be readily seen that the ground colour of the whole insect is ochre-yellow, and that the rusty-black colour above is produced by innumerable black dots which cover the legs as well as the wings and upper surface of the body.

It is interesting to notice the change in colour which the young bugs undergo as they pass through successive moults. When the bugs are young the under side of the abdomen is first greenish, then ashy-grey, and finally ochre-yellow. (Are the head and legs always of the same colour as the body?)

HEAD.—The study of the head of an insect is always instructive. The most prominent part of the head of a squash bug is the feelers or antennæ, which are long, and divided into segments, the first and last being the stoutest. (Fig. 38.)

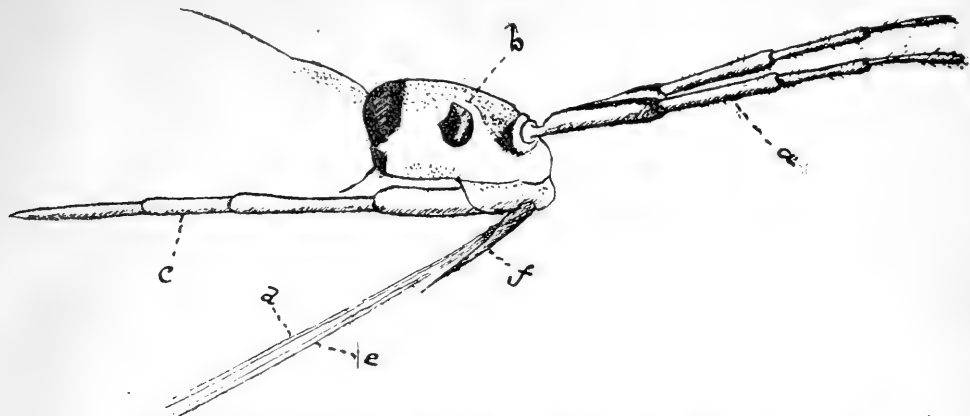


FIG. 38.—The head of the squash bug showing the antennae (a), the eyes (b), the 4-jointed beak (c), the four lances (d) and (e), and the labrum (f). (Original.)

The two large compound eyes situated behind the foot of the antennae are very similar to those of the cabbage butterfly, described and illustrated in last year's Report. In addition to the two compound eyes two simple eyes or ocelli may be seen with the aid of a magnifying glass between the large eyes. They look like minute glass beads.

If the under side of the head be examined a slender beak-like organ can be seen extending from the head backwards beyond the second pair of legs, (Figs 38 and 39), and a magnifying glass will show that this beak-like organ is a 4-jointed sheath, slit along one side. With the aid of a needle further information can be obtained by exposing the contents of the sheath. These are four fine lance-like structures which are apparently attached to a broader appendage near the head. (Fig. 38.)

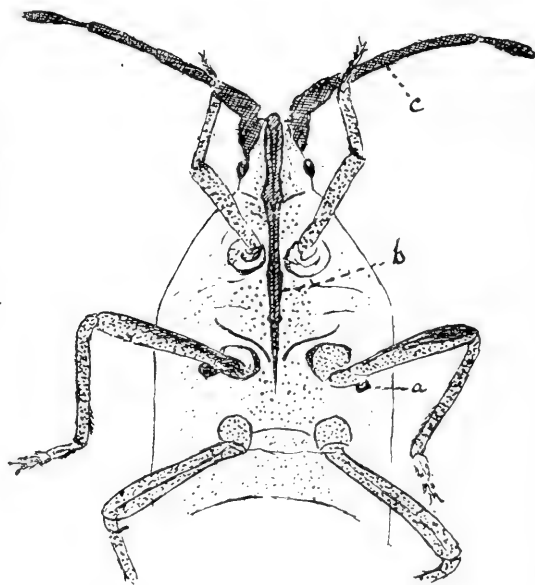


FIG. 39.—The under surface of the squash bug showing the position of the two glands, (a) which secrete the foul odour, the beak (b), the antennae (c). (Original.)

The mouth-parts of the common locust are shown in figure 40, and it is evident that the different parts are adapted for biting and holding the object while biting. With the squash bug, however, the parts are not adapted for biting, but for sucking. The lower lip or labium forms the 4-jointed, grooved sheath, and the mandibles and maxillae form the four lance-like piercers, while the labrum is a scale-like flap to which, apparently, the piercers are attached. It will be observed that there are no palpi on either the maxillae or labium, but the parts have been modified for piercing and sucking.

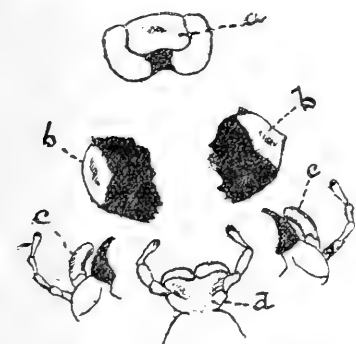


FIG. 40.—The mouth parts of the common locust dissected out, the upper lip or labrum, (a) the mandibles, (b) the maxillae, (c) and the under lip or labium, (d) (Original.)

The piercers penetrate the tissues of the leaf or stem, and by means of muscles at the base of the beak the fluids are drawn up. While the insect is puncturing the tissues with the piercers it drops in a little poison which causes the cells close by to wilt and die. Some observers consider the amount of damage done by the poison to be greater than that produced by the loss of sap.

ODOUR.—The cause of the very disagreeable odour of squash bugs is a fluid which is secreted by two glands through two openings on the under surface of the body, situated close to the second pair of legs on the last segment of the thorax. (Fig. 39, a.)

WINGS.—The wings of the squash bug are characteristic of the large order of insects to which it belongs,—the HEMIPTERA, that is, the basal half of each of the outer pair of wings is thickened, while the outer half remains thin, membranous, and veiny. (Fig 41) The under pair of wings are thin and membranous, and are folded under the larger outer pair.

EGGS.—During July and even later the eggs are laid on the under side of the leaves in groups varying from 4 or 5 to 30 or 50. They are dull-red in colour, smooth and shining, about one twenty-fifth of an inch in length, and slightly flattened on two sides.

NYMPHS.—The young bugs escape from the eggs in about ten days, and proceed directly to abstract nourishing fluids from the stems. The nymphs may be found in all stages of development under wilted leaves during August and September. (Fig. 37). It will be observed that the nymphs are broader in proportion to their length than the adults are, and their head and first segment of the thorax are small. As the nymphs develop by moulting the wings become longer.

REMEDIES.—From the fact that the squash bug does not eat its food, it may be inferred that Paris Green placed on the stems or leaves is of no use in killing the pest. Many substances have been tried, but most have been found unsatisfactory. Kerosene emulsion diluted with 9 parts of water and sprayed upon the vines has given fairly good results, but perhaps the best plan is to clean up the squash patches thoroughly in the fall; to place pieces of boards and chips during the summer among the vines to decoy the bugs, when they may be readily killed; and to pick the old bugs and eggs in early summer and destroy them.

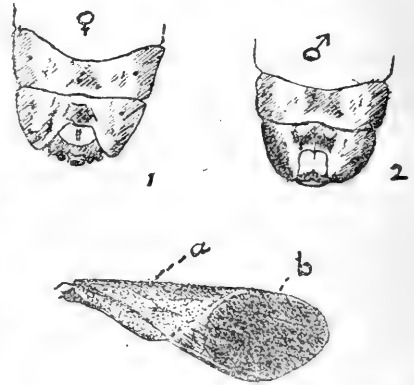


FIG. 41.—The outer wing of the Squash Bug showing the thickened inner half (a) and the membranous outer half (b). (Original)
The last segments of the abdomen showing the differences between the female (1) and male (2).

TOPICS FOR OBSERVATION.

1. The month, and day of the month when the young squash bugs are first observed.
2. The location of the eggs on the leaf,—their number, colour and shape.
3. The hatching of the eggs,—the duration of the egg state, the way the young bugs escape from the eggs.
4. The moulting of the nymphs,—the number of moults, the changes with each successive moult, and the duration of each stage.
5. The offensive odour,—the position of the secreting glands, the use of the fluid to the insect.
6. The best methods of controlling the insect in melon patches.
7. Males and females,—distinction and relative numbers. (Fig. 41, 1, 2).
8. The development of the wing.
9. Parasites.
10. Other insect enemies of the melon patch.
11. Mode of feeding,—the way the fluids are drawn up.

THE BREEDING OF LEPIDOPTERA, WITH NOTES ON THE INFLATION OF LARVÆ.

BY ARTHUR GIBSON, CENTRAL EXPERIMENTAL FARM, OTTAWA.

The value attached to the breeding of insects cannot be over-estimated. The facts concerning the life-histories of species, resulting from careful work in rearing specimens, are of the greatest importance, and any person having a taste for this branch of study has many opportunities of doing excellent work. There is so much yet to be done in studying out the life-histories of insects, and so few people who care to take the time or trouble to do careful work, that those who are disposed have a field in which employment of a useful nature can be found. In the Order Lepidoptera alone there are hundreds of species which have never been properly worked out, and information of an authentic nature in regard to such is much desired. Facts concerning certain stages or habits of even some of our commonest butterflies and moths are badly wanted.

In breeding Lepidoptera from the egg to the imago, there is much of interest to observe. Some of the stages are intensely interesting, as everyone who has attempted breeding with any degree of success knows. The true object of breeding insects is not to get perfect specimens of the imago, but to study their earlier stages, taking careful notes of observations made, and giving the result of information thus obtained to others, through the medium of entomological publications. It cannot be said that such work is hard, but at the same time great care and accuracy are required, without mentioning the need of a good stock of patience.

To meet with the best results, two very important points must be borne in mind, and these are to see that the jars are kept thoroughly cleaned, and that sufficient, but not too much, of fresh food-plant is always present. The larvæ of butterflies, especially, require extra care and attention to see that the breeding-jars are always clean, and that the food-plant is kept fresh. Carelessness in this respect oftentimes causes failure. Breeding-jars should be washed out at least every day, if the best results are desired, even twice a day is not too often for delicate larvæ. It is also often best to change the food plant twice a day.

In studying the earlier stages in the life-history of a butterfly or moth, as soon as the eggs hatch, it is well to put one of the larvæ in a small jar, keeping it separate from the others, so as to watch it carefully through its different moults. Two could be kept in the same jar, but instead of this it is better to have two small jars, one for each caterpillar. These should be kept beside the remainder of the brood, if any, so that they may also be watched, as many vary in the same stage. It is important that careful descriptions of the egg, the larva (in all its stages), the chrysalis, or pupa, and cocoon, if there is one, should be made, noting in fact everything of importance bearing upon the life-history of the species.

For the most part ordinary jelly jars with tin lids will answer for breeding lepidoptera; those with the rounded bottoms are preferable, as they do away with the chance of moisture gathering in the corners. Two or three different sized jars are more convenient than having them all the same. Of course if a large number of the same larvae are being reared bigger jars or breeding cages, will be found necessary. Some writers recommend tin boxes of various sizes. These also are excellent receptacles, and it is claimed that it is not necessary, when breeding sphingids, to put earth in the tin as the larvæ will readily pupate on the bottom of the box.

Careful watch must be made for the moults of the larvæ. Before moulting the caterpillar, as a rule, stops feeding for a day or so, during which time the front segments become swollen, so much so that they appear larger than the head, which with the cast skin, soon afterwards, usually during the following or the next day, is thrown off. As soon as the larva has moulted, a careful description should be taken, noting its length, shape, colour and arrangement of markings, size and shape of head, etc., etc. The cast skin and head should be preserved in a small bottle, or box, with careful data. The empty cocoon, pupa, or chrysalis, should also be preserved, as well as the egg shells.

A method by which the eggs of many moths may be secured is to capture a female, enclosing her alive in a small box for a day or so, and if she has not already laid eggs, it

is probable that she will do so in confinement. All females, however, will not lay eggs in confinement; from some it is exceedingly difficult to obtain ova. Eggs from butterflies especially are hard to procure, and extra inducements have sometimes to be offered. A good plan is to feed the female with a sweetened fluid, such as honey diluted in water. This can be accomplished by touching the tongue with a fine camel's hair brush which has been dipped in the fluid. Another method to secure eggs is to imprison the female in a bag made of muslin, or some such material, placed over the plant upon which the larvæ feed. In the case of larvæ which feed on low plants such as grasses, etc., if a small plant is transferred to a flower-pot, a covering of muslin, with the aid of two pieces of wire bent into a hoop, can be placed over the plant and the living female enclosed. It is best to have a portion of the plant touching the muslin at the top, as many species will leave the plant and deposit some, if not all, of their eggs on the muslin. If eggs can be secured through a friend living at a distance, they will travel safely through the mail. The present summer several batches of eggs were received at Ottawa from points in the Rocky Mountains, Northwest Territories and other distant localities.

If a number of specimens of the same species are being bred it is nice to have a specimen or two of each larval stage inflated, as it is important that as much of the life history as possible be preserved for the cabinet. If the first stages are too small to inflate, they can of course be preserved in alcohol, or some other fluid, or they may be dried on hot sand with some success. There are various methods of inflating larvæ, and some experience is needed before satisfactory results will be attained. Hairy caterpillars especially are difficult to inflate, but experience will teach the beginner that great care and much patience are required in order to do good work.

For inflating larvæ very few appliances are necessary, and these are not at all expensive. They can easily be had from most of the dealers in entomological supplies.

When the larva has reached the stage at which it is to be preserved the first thing to do, of course, is to kill it, and this can be done by dropping it for a minute or two into a receptacle containing methylated spirits. When the caterpillar is dead it can be taken out of the liquid with a small pair of forceps, and placed on its side on a piece of blotting paper. When this is done take a small piece of the same paper in the left hand placing it over the larva, gently pressing the front segments, with exception of head. A small sharp pointed instrument should then be inserted into the anal orifice, so as to admit of some of the liquid contents coming out. For all except minute larvae a large needle, or a pair of small forceps with curved points, may be used for this purpose. Further pressure will now be necessary in order that the remaining contents may be squeezed out. Just sufficient pressure should be applied to remove the contents; if too much is given the skin will be bruised.

When the viscera have all been removed, insert the necessary-sized glass inflating-tube into the anal orifice. The larger of these tubes have clips or spring attachments to hold the larval skin. If the caterpillar be small it can be fastened to a smaller tube by means of a thread of fine silk wound around the posterior segment. The inflating-tube can now be inserted into the rubber tube of the double bulb inflator and the empty skin gently inflated. If everything is all right it can then be placed in the oven and slowly dried. A suitable oven can be made by any tinsmith, and is simply a tin box about 6 inches long by 4 inches wide and $2\frac{1}{2}$ inches deep, supported on legs to allow of the lamp being placed beneath it, and having an opening in one end to insert the larva, with another at the bottom for the circulation of air or to allow the escape of some of the heat. A sheet of glass let into the top enables the operator to see what he is doing. The drying process should be carried on over the hottest place, commencing with the front segments and working backwards. Care must be taken not to hold the same portion of the larval skin too long over the heat, but the segments that are being dried should be kept turned, so that all sides may be dried about the same time. While this is going on too much air must not be pumped into the skin; if this is done it will stretch the larva and give it an unnatural appearance.

Any small spirit lamp will do to supply the heat, which must be regulated according to the nature of the species being inflated. Too great a heat will destroy the colors of many larvæ, and this is especially so in the case of delicate green caterpillars. Hairy larvæ, as already mentioned, are rather difficult to blow, as the hairs are very easily rubbed off, and unless care is taken in the inflating the segments will be sure to expand

too much and thus be puffed out unnaturally. When the skin is ready for the oven a pair of forceps will be found a means of help in inserting the inflating-tube into the vent.

After the larval skin is thoroughly dried care should be taken in removing it from the inflating-tube. This can easily be done in most cases by simply forcing the skin off the tube by means of the thumb-nail of the right hand. The caterpillars may then be mounted on a piece of fine wire wound tightly around the pin five or six times, the lower end of the wire being neatly cut off. The portion on which the larva is to be mounted may be cut according to the size of the caterpillar. Any good cement, such as that used for repairing insects, may be employed to fasten the blown skin to the wire.

NOTES ON TWO LONGICORN BEETLES AFFECTING GROWING NURSERY STOCK.

By F. M. WEBSTER, WOOSTER, O.

With the rapid changes in the flora of the country, brought about by advance in our civilization, there must of necessity come changes in the habits of such of the animal life as is dependent upon this flora for their food supply. Nor do the influences stop here, for it is frequently not difficult to observe the effects of such changes even in the parasitic enemies of these animals.

Hardly a season passes but that some old and well known insect exhibits some characteristic not before observed. Sometimes this, to us, new phase of its sociology may not again be noticed for years, or it may continue and indeed increase to such an extent as to become a normal characteristic of the species. As instances of this change of habit, the adult of the Western Corn Root Worm, *Diabrotica longicornis*, was formerly known only as a green beetle found on the blossoms of thistle and golden-rod; whereas, now, it swarms over the corn fields of the middle West in myriads, and the larvæ are one of the worst pests of the corn field. It is only within the last three years that the two ground beetles, *Harpalus caliginosus*, and *H. pennsylvanicus*, have come into prominence as strawberry insects.

The first species here considered is the coated Saperda, or the Linden borer, *Saperda vestita*, Say (Fig. 42) described in 1824, from specimens taken near the southern extremity of Lake Michigan, but was also known at that time to occur in Pennsylvania. Though common, the insect does not appear to have anywhere become seriously destructive though it was well known to Harris as early as 1832 and said by him to have been destructive to the European Lindens in Cambridge, Massachusetts, in 1843 and 1844.

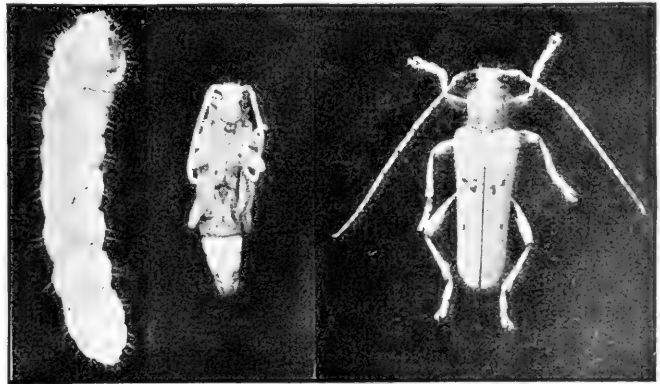


Fig. 42.—*Saperda vestita* Say; 1, larva; 2, pupa; 3, adult; all slightly enlarged.

Dr. Paul Smith, in a letter written May, 1844, quoted by Dr. Harris in his "Insects Injurious to Vegetation" gave an account of an attack upon European Linden trees in Washington and Independence Squares, Philadelphia. The trees were attacked about seven years before but within two years it had been found necessary to cut down forty-seven of these European Lindens in Washington Square alone. The American Lindens were also injured but apparently to a less degree. One of the Lindens mentioned by Dr. Harris was very large, the trunk measuring 8 feet, 5 inches in circumference 5 feet from the ground. A strip of bark two feet wide at the bottom, and extending to the top of

the trunk, was destroyed, and the exposed surface of the wood was pierced and grooved with countless numbers of holes where the borers had been bred, and whence swarms of these beetles were supposed to have issued in past times. Some of the larger limbs and a portion of the top of the tree fell down, apparently in consequence of the ravages of these insects.

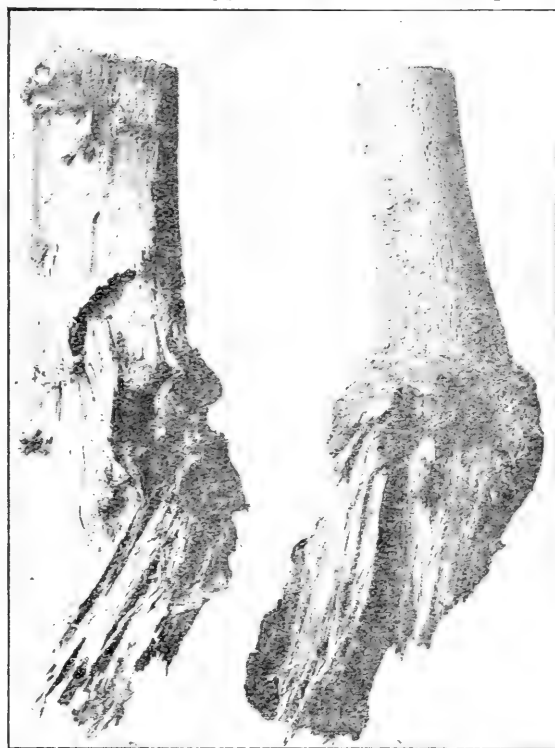


Fig. 43.—Bases of affected trees, about natural size. Original, after photographs by P. A. Hinman.

candida, the adult of which is shown in Figure 44. These young trees growing in the nursery row were cut and transplanted to the insectary on the 28th of August. On the 15th of January, 1900, examination of these trees (Fig 43) revealed one larva still active in the rotten wood, and about four inches below the surface of the ground. On April 4th one adult *Saperda vestita* emerged. It must be remembered that this was under insectary conditions. The next day the entire lot of material was examined. One additional larva (No. 1.) and a pupa (No. 2.) were found. These larvae had worked in the wood at the root, entirely below the surface of the ground, and, in fact, the upper limit of their burrowing was from two to four inches below the ground. When ready to pupate the larvae evidently burrow their way upward in the wood to the level of the ground surface, or within an inch or two of it. They pupated in cells cut

at the base of young European Lindens and gouging two parallel rings around the trunk which form annular swellings." Thus it will be seen that the insect exhibits a partiality for the European Linden, but its injuries during later years do not appear to have attracted the attention of entomologists to any large degree. Last year, my former assistant, Mr. Mally, while inspecting nurseries, found a number of small Linden trees in the nursery row that had been very seriously injured by larvae burrowing in the trunks below ground. Mr. Mally, from the appearance of these larvae, thought they might be those of the Round-headed Apple Tree borer, *Saperda can-*

In the American Entomologist, New Series, Volume I, page 271, Dr. O. V. Riley cites the species as very injurious to the European Linden in Cambridge, Massachusetts, and Philadelphia, Pennsylvania, quoting Harris as authority, and also adds "boring at the base of young European Lindens and gouging two parallel rings around the trunk which form annular swellings." Thus it will be seen that the insect exhibits a partiality for the European Linden, but its injuries during later years do not appear to have attracted the attention of entomologists to any large degree. Last year, my former assistant, Mr. Mally, while inspecting nurseries, found a number of small Linden trees in the nursery row that had been very seriously injured by larvae burrowing in the trunks below ground. Mr. Mally, from the appearance of these larvae, thought they might be those of the Round-headed Apple Tree borer, *Saperda can-*



Fig. 44.—*Saperda candida* Say.

diagonally across the grain of the wood at an angle of about 45 degrees to the upward channel.

So far as known to me this is the first instance of this insect having been observed attacking nursery trees, and also the first record of their working below the ground. All previous records represent them as working above the surface, their attacks being confined to the trunk and larger branches.

Dr. Harris states that the adult *Saperda vestita*, after having emerged from the trunk and larger branches of the trees, will fly into the top and there feed upon the epidermis of the tender twigs and the petioles of the leaves, often wholly denuding the latter and causing the leaves to fall. It may not be out of place to state that a few years ago a specimen of *Saperda candida* (Fig. 44) was sent me, accused of gnawing into the young growing apples, and specimens of these that accompanied the insect gave abundant evidence of the truth of the statement.

The species under consideration is said to deposit their eggs, two or three in a place, upon the trunk and branches, especially about the forks, making slight incisions and punctures for their reception, with their strong jaws. As many as 90 eggs have been taken from a single beetle. The larvæ, hatching from these eggs, undermine the bark to the extent of six or eight inches, often penetrating the wood an equal distance.

This appears to be an instance of an old and well known species taking on a new habit, as I can find nothing on record of their having ever been before observed depredating in the nursery row, and there is certainly nothing on record relative to the larvæ working below the surface of the ground.

The second species, with which this paper has to deal is *Oberea bimaculata*. While this is, perhaps, more of a small fruit than a nursery pest, nevertheless, we have come in contact with it in our nursery inspection, although not especially as affecting nursery stock. In Bulletin 96 of the Ohio Agricultural Experiment Station, pages 20-22, I gave an account of this insect and stated that we had reared it from witch hazel *Hamamelis virginiana*, also from apple twigs. The specimen is shown in Figure 40. A further study of this insect has shown that it is *Oberea tripunctata*. Specialists make this a variety of *bimaculata*. Since this work was done, I have twice reared the true *Oberea bimaculata* from raspberry, which it is known to infest. There seems now to be a dividing line between

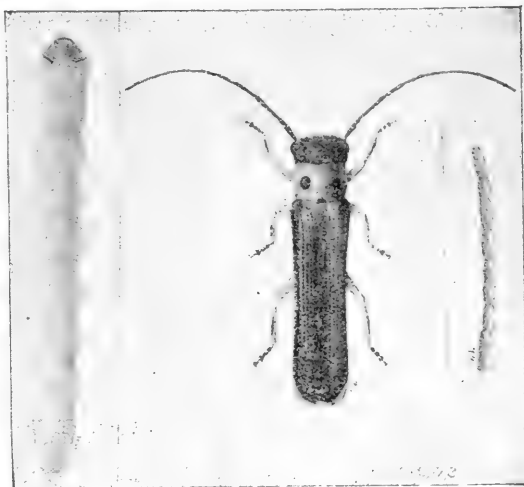


Fig. 45.—*Oberea bimaculata* var. *tripunctata* Sw. Larva enlarged at left; Section of excreta at right, all enlarged.

these two forms, *tripunctata* having a variety of food plants, while *bimaculata* appears to confine itself to canes of *Rubus*. The object in presenting this matter is to correct a possible error in Bulletin 96, in terming the species there reared from witch hazel and apple twigs, *Oberea bimaculata*, without further qualifications. Although as stated, the two are considered to be the same species by systematists the rearings at the Station imply that there is a sharp distinction between the two in the matter of food habits, and it seems to me that this would be very strong evidence at any rate, that may, some day, be used in separating the two insects. Any one wishing to follow up our studies of these species will find them recorded in Bulletin 96, of the Ohio Agricultural Experiment Station, pages 20 22, and the Journal of the New York Entomological Society, Volume V, pages 203 204, with illustrations, and Volume XI, pages 437-438 of Entomological News. It will be a very interesting study, and one fraught with some economic importance, to carry on a large number of rearings, both from *Rubus* and other plants. If this food distinction between the two forms holds good throughout, *Oberea tripunctata*, Swederus will be entitled to rank as a species.

A very valuable contribution to our literature upon these insects will be found in Bulletin 23, Agricultural Experiment Station, Cornell University, pages 120-24, by Professor Slingerland. The two forms are so exceedingly alike in appearance that none but expert entomologists have been able to separate them. As relating to this matter Mr. F. H. Chittenden, Assistant Entomologist in the Department of Agriculture, wrote me Feb. 8th, 1899, also stating that he had been unable to avoid the impression that the two insects were distinct, notwithstanding the opinion of specialists to the contrary. I speak of this more in the way of a suggestion, as it seemed to me a problem which a careful entomological student may well take up and solve.

HABITS OF THE LARVÆ OF DERMESTES TALPINUS (MANN.)

BY PERCY B. GREGSON, WAGHORN, ALBERTA.

To fur trappers in the far North West the larva of this beetle, which Dr. Fletcher has kindly identified for me, is but too well known. (Fig. 46.) It seems to be ubiquitous and almost omnivorous. Hitherto, however, it has been understood to feed only on dead things, such as fur hide, skin, bacon, wool, dead insects, etc., but in rearing it, as I have in considerable numbers, I have noticed features which show the larva in its very early infancy to be endowed with a very extraordinary activity, or to be a parasite of living insects. These features I should like now to record.

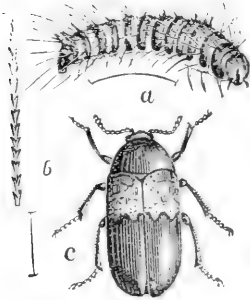


Fig. 46 represents the beetle and larva (magnified) of *Dermestes talpinus*—a most familiar species.

My practice when spreading lepidoptera is to place the setting-boards within a box with closely-fitting door, but the frequent destruction of the insect by the *Talpinus* larva, before the insect itself had become sufficiently set for removing, determined me to investigate the early existence of the larva. I noticed that the butterflies I caught in May and early June (*Colias occidentalis*, *E. discoidalis*, etc.) were peculiarly liable to attacks by this pest. Others caught later in the year were free from them. When I discovered the larva on the setting boards (generally on the second or third day after setting the insect) the largest of the larvæ did not exceed one line in length, and from the dust-like frass under the body of the butterfly and the excavation made in the body, the larva had evidently been at work for some time. It being easily possible for such minute creatures to have crept through

some small crack into the interior of the box, I decided this year (1900) to rear a few, as soon as I could get any, in a tightly closed tin tobacco box three inches deep, for I found they could not crawl up the tin sides of such a box. They cannot crawl up tin at any slope greater than 30 degrees. Placed on the higher part of such a slope, they slide down to the bottom.

On the 12th of May, 1900, I found a *D. talpinus* larva on a hybernated specimen of *Vanessa cardui* which I had captured and spread on the 10th. This little larva (not a line in length) I at once placed in the empty tin tobacco box, with the carcase of the *V. cardui*, and closed the lid and saw that there was no space for ingress of even the minutest insect, assuming that it first could scale the tin sides of the box. Being much occupied for the next few days, I simply added a *Colias* or two (caught in the manner I shall presently describe) without disturbing the little grub which was within the carcase of the *V. cardui*. On the 25th May I introduced to him a *Colias occidentalis* caught that morning. I always carry with me when hunting near home for lepidoptera, a shallow ($\frac{1}{2}$ inch deep) tin cigarette box whose lid fits very tightly, requiring an effort in fact to open, and into this box I at once place, direct from the net, my captured specimens, folding them in papers on the spot (first, however, killing the *Colias*, *Erebias* and such sized insects by pressure on the thorax in the net) and it is therefore impossible for

any foreign insect to gain access to the interior. I followed this course on the 25th May, and the *C. occidentalis* I introduced to the Talpinus larva I took direct from its paper in the shallow box, as I did all the insects with which I fed my Talpinus, and dropped it into the larger tin box. On exploring the interior of this box in the evening of the 25th I found a second *Marmoratus* larva (very minute) feeding on the body of the newly introduced Colias.

On 28th May I introduced another *C. occidentalis*, caught under and treated in precisely similar fashion to the others above mentioned, and soon afterwards observed a third little Talpinus larva on the bottom of the tin box. There were now three of these larvæ, and for the first time I introduced to them a small piece of coyote fur. This, however, was not touched until the carcasses still remaining had been devoured, and there was no further increase in the family. On the 4th June, however, I placed two more fresh *C. occidentalis* in the box (both caught as before) and as I had now become accustomed to mysterious additions to the family I presently observed without surprise a minute Talpinus crawling from just under the right wing of the last introduced butterfly. Here then were four larvæ, all of which had been obtained through freshly captured butterflies, and none of which could have possibly crawled into the deep, close-lidded tin box, nor can I imagine that they could by any possibility have gained admission to the shallow tin collecting box and to the folded papers within, unless they were already on the bodies of the butterflies when captured. In which case their activity seems little short of marvellous.

Although on subsequently ceasing to feed the larvæ with butterflies they ate the fur hide, they nevertheless deserted it again for bodies of insects when I once more introduced that kind of food. I have even found one in the dead body of a common house fly.

In closing these few remarks I may add that I procured a dozen of these larvæ from butterflies in the above described fashion this year. The first to pupate did so on 7th July and hatched on 9th August.

OBSERVATIONS ON SEVERAL SPECIES OF DERMESTIDÆ.

By F. M. WEBSTER, WOOSTER, O.

The necrophagous habits of many of the species of this family of insects are well known, but it is doubtful if the phytophagous habits are very much less emphasized in other species.

Byturus unicolor Say, is, perhaps, best known as the Raspberry Fruit beetle, and I have observed it feeding, usually in pairs, on the blossoms of *Geum*, either *rivale* L. or *album* Gmel. *Byturus tomentosus* Fab., is destructive to the Raspberry in England.

The common introduced species, *Dermestes lardarius* Linn., while affecting dried skins, meats, etc., is also fond of bread and other grain products, and has twice been reported as destroying honey comb. *D. vulpinus* Fab., has been reported as damaging tobacco.

Perimegatomia cylindricum Kirby, var. *angulare*, has been reported as a possible enemy of the Fluted scale, *Icerya purchasi* Maskell.

Attagenus piceus Oliv., has become so destructive to woolen fabrics and carpets as to receive the name of Pitchy or Black Carpet-beetle. It has been sent to me from Indiana breeding in beet seeds, larvæ, pupæ, and adults all being present in the seeds when received.

Trogoderma ornatum Say, though beyond a doubt a museum pest, is a vegetable feeder as well. From the seed of the garden sunflower, collected May 28, 1899, this beetle emerged, in the insectary, June 17, 1900. From seeds of *Ambrosia trifida*, collected October 10, 1899, a specimen emerged in the insectary, May 19, 1900. From seed cluster of *Euthemia graminifolia*, collected October 12, 1899, beetles emerged in the insectary, March 31, 1900. These seeds were infested by unknown larvæ when collected.

Anthrenus scrophulariæ Linn, so well known as a carpet beetle, I have, for years, found in abundance during early spring, in the blossoms of the Tulip, and almost invariably in those of a pure white color, or nearly so. I fully believe that this is more

of an out of door insect in this country than we at present suppose, though we know that, at home in Europe from whence we received it, the insect is unknown as a household pest.

Anthrenus varius Fab., I have taken in the blossoms of Tulip, in connection with the preceding, and also by itself in the Peony blossoms in June. A single individual was found in a breeding cage, supposed to be secure against the ingress as well as the egress of the smallest insects, in which were thorns of the Honey Locust, infested with lepidopterous larvæ. Of course, in this case, the beetle might have made its way into the cage, though the probabilities are that it did not. I have reared either this species or *A. musceorum* Linn., from masses of spiders' nests mingled with the bodies of dead insects, as well as the living, in hibernation, under the loose bark of a hickory tree.

NOTES ON DANAIS ARCHIPPUS.

By C. W. NASH, TORONTO.

During the past season (1900) I have made the following notes of the movements of this butterfly in the neighbourhood of Toronto :

June 14th.—Saw first Archippus butterflies. There were three of them loitering over the willow bushes near the shore of Lake Ontario. They were much faded and ragged ; all of them were flying eastward.

June 20th.—Archippus butterflies are now common. All are very dull coloured ; their scales being worn off and wings ragged, they look old.

July 21st.—I examined a large number of *Asclepias* for Archippus larvæ, but found only one, about half-grown. The butterflies are common, but all seen are dull and worn.

July 22nd.—On a small patch of *Asclepias*, near my house, I found a number of Archippus larvæ of various sizes, some very small and ranging up to full-grown ones ; also found several chrysalids.

I watched several of these chrysalids for some time, but not one of those I kept under observation produced a living butterfly. In each case the insect reached the perfect stage, or nearly so, and then died in the shell. None of these appeared to be parasitized ; they simply dried up.

August 5th.—Archippus butterflies are now congregating about the trees near my house, where they roost ; some of the flocks contain over one hundred. These are all large, bright coloured specimens, evidently produced this season.

September 4th.—Archippus butterflies were streaming along the lake shore in myriads all this afternoon. I travelled through the flock for about five miles, and in that distance there was no break in the flight ; all of them were flying westward. At times individuals would alight on the ground, always with their heads pointing westward. They seemed generally to select a shady spot to alight on, and in some places the ground was covered with them. After resting a few minutes they would get up again and go on with the flying crowds. The wind was from the north-west, very light, in fact scarcely perceptible.

Just at sunset I visited the trees they frequent near my house and found a great many roosting there.

September 6th.—Very few Archippus butterflies about to-day.

September 7th.—Only saw a few individuals.

September 28th.—Saw a few Archippus butterflies to-day, perhaps half a dozen.

October 6th.—A few Archippus still about.

Prof. Comstock and some other entomologists say that no birds will eat the *D. Archippus*. This is a mistake, so far as the butterfly is concerned, for I have myself taken them from the stomach of cuckoos. So far I have not identified the larvæ in the stomach of any bird, and it may be that they are never eaten by them.

[At London, Ontario, this year the Archippus butterfly was seen as late as November 2nd. A specimen captured on the 27th of October lived for over a fortnight in the Society's room and died apparently from a chill, as it had been left on the windowsill one cold night.]

THE PRESENT STATUS OF THE SAN JOSÉ SCALE IN ONTARIO.

BY PROF. WM. LOCHHEAD, GUELPH.

It will be remembered that the Government relaxed its strong policy of extermination in May of 1899, owing to the great opposition which was encountered. Nothing was done by the owners of the infested orchards to prevent the spread of the scale until the spring of the present year, 1900, when the Government came to their help and offered to provide whale-oil soap and crude petroleum at half price. While many orchard men took advantage of the liberal offer, it is yet a regrettable fact that many failed to buy soap or crude petroleum, or to use any other remedy. Inspection of the treated orchards, moreover, reveals the fact that the spraying was often done carelessly, or too little of the soap was used per tree. As a result of such careless treatment the scale is even more abundant at the close of this season than it was at the close of last season and the infested trees are more plainly detected. It may be said with a great deal of truth that in the infested areas of Guilds and Niagara no orchard is free from scale, and orchards which had not more than ten per cent. of the trees marked for scale last year have now scale on nearly every tree. While careless treatment has done so little to check the spread of the scale, yet some good results have been secured by careful spraying with good whale-oil soap and crude petroleum. Where whole blocks were treated carefully the intensity as well as the spread has been checked appreciably, and some of the best fruit was picked from trees which had been marked for one or two years.

In the Niagara and St. Catharines districts the owners are, as a rule, indifferent, and the impression seems to have spread that the scale is not any worse, if as bad, than some other evils against which the fruit-grower has to contend, and which are infesting orchards, such as *Yellows*, *Rose-Leaf*, small peaches, *Blight*, etc. A cursory inspection fails to show many apple trees which have given way, but many dead limbs can be found, as well as many dead peach trees.

In the Guilds district, Kent county, the scale has gained great headway and moderately infested orchards of last spring are now badly infested, for no spraying was done to check the progress of the pest. There, however, the owners are beginning to realize the necessity for action, and several have already purchased spray pumps and are preparing to combat the scale with vigor this coming winter and early spring. Time is evidently required to educate the fruit growers to give their orchards proper care.

It is difficult to state with any degree of certainty the extent of spread of the scale to new districts since the work of inspection of orchards was discontinued. Two new locations, however, have been discovered accidentally—one noted in London East by Mr. J. Dearness, and another at Essex Centre by the writer. The latter case was a very severe one, and it is probable that the scale has spread a considerable distance from this new centre.

Opinions differ as to the relative merits of good whale-oil soap, and crude petroleum. Some consider the latter a too dangerous remedy to be applied by careless sprayers, and prefer to continue the whale-oil soap treatment. Others, again, maintain that crude petroleum has given better results, both in controlling the scale, and in invigorating the trees. As a result of the experiments this year some valuable points have been gained. The whale-oil soap must be of a certain standard of quality to give results at all effective, and in the application of the crude petroleum good results depend on the method of spraying—i.e., in the handling of the nozzle, rather than on the percentage of oil, as Mr. G. E. Fisher has already explained to this meeting.

A PARASITE OF THE SAN JOSÉ SCALE.

BY JOHN DEARNESS, LONDON.

Last year I received a packet of twigs bearing scale insects, mostly San José, from Mr. John Gordon, Guilds P.O., Kent Co., on some of which there were parasitic mites preying at least on the well-grown females of the species of scale insect named. On some

specimens received this year from the same neighborhood these mites were very numerous. I mounted some specimens and with a female S. J. put them in the Society's collection of microscopic slides. As many as eighteen larval mites were observed under one large scale.

Mr. N. Banks, Washington, a well-known expert on mites, reports it *Tyroglyphus malus*, Skinner, which is known to prey on the larvæ of the oyster-shell bark louse. Dr. Howard writes that J. Lignières published a valuable article on this mite in the proceedings of the Société Zoologique de France in 1893. The habits of the mite are given accompanied by excellent anatomical figures.

"The San José scale is spreading very fast this year" in Ontario. This statement was made again and again last season, and it is repeated this year. Some people who have heard it, have inferred that since the suspension of the cutting and burning of affected trees the insect has multiplied at a more rapid rate than formerly. The discovery of new areas and new locations of infestation does not prove that the scale has increased abnormally last year and this one. That the pest was not in these newly discovered infestations in 1898 or in previous years is only an assumption; to say that the township or even the orchard was inspected in that year does not by any means prove that the scale was not there.

The officers' assurance in 1899 that the scale was well-nigh "surrounded" was based on the belief that by tracing the deliveries of stock from the few infested nurseries all initial points of its distribution could be located. The possibility, nay the probability, of a more general introduction may be reasonably suspected from a consideration of the methods adopted by some nursery agencies. For several years past, as a county school inspector, I have received one or more circular letters asking for a list of the addresses of the teachers in the county, the reward usually offered for the trouble was one or more young trees or flowering shrubs. The teachers whose addresses were thus obtained were urged to do some canvassing in their respective neighborhoods, or, in some cases, to send a list of orchard owners or probable purchasers in consideration of a like reward to that just mentioned. The badly infested New Jersey nurseries were as likely as any others to supply stock to the jobbers who sought to use the teachers as distributors of it.

In addition to the stock imported and scattered all over the country by jobbers there is no doubt that individual farmers here and there imported young trees direct from the nurseries. Dealers would not put and keep their advertisements in the papers without seeing some benefit from them. These are some of the facts to be considered before accepting the conclusion that all or nearly all the centres of infestation in Ontario were known in 1899 and that new ones are due to the interruption of the methods in operation in the spring of that year. Incalculable good came from the tracing and destroying of affected nursery stock. Upwards of a hundred centres of evil were thus probably rendered harmless. All that the San José scale has cost Ontario has been doubly and trebly repaid by this action alone. On the other hand harm came from the sense of false security begotten of reliance on the reports of immunity based on a superficial examination of the orchards in the fruit growing townships.

The hope for the future successful disposal of the scale-insect difficulty lies not in legislative intervention but in education. Every farmers' institute and every school-house should be a point from which light should be thrown on the nature, life-history and method of treatment of our insect and fungal pests. Lessons on the scale insects could be made as useful and made to yield as good training for the observing and reasoning powers as an equal number of lessons in spelling, algebra, arithmetic, etc.

In August Rev. Mr. Seaborne discovered an infestation of San José scale in London East. In September Mr. Ellwood of St. Thomas sprayed the trees with a very dilute solution of coal-oil to which some common salt was added. He claims that the salt makes the solution more effective against the insect without correspondingly endangering the vitality of the tree. I visited the place twice since Mr. Ellwood's treatment. The leaves of the sprayed trees were injured more or less, but I found no living scale. On one branch I took away there were two females found which did not appear to be dead. On a branch taken subsequently no living scale insects were found. The developments of next spring will tell whether the treatment is effective.

THE ASSOCIATION OF ECONOMIC ENTOMOLOGISTS.*

The twelfth annual meeting of this society, which was founded in Toronto in 1889, was held at Columbia College, New York, on the 22nd and 23rd of June, 1900. In the absence of the President, Prof. Bruner, the chair was taken by the Vice-President, Prof. U. P. Gillette, who read an address on "the objects of the Association of Economic Entomologists." The first of these is "to discuss new discoveries." This implies, the speaker said, that new discoveries are to be made. It takes for granted that the members are to be scientific workers and not mere book students, content to thrash over old straw or to step exactly in the footprints of another. After referring briefly to Dr. Riley's "introduction of the *Vedalia* to the relief of disheartened fruit growers" in California, and to Dr. Howard's having made possible the successful culture of the fig through the establishment of *Blastophaga grossorum*, he stated that it would be difficult to find so small a body of workers, with so meagre an amount of time to be devoted to original research, in any other science who can show larger results in the way of new discoveries in so short a time.

A further object is "to exchange experiences and to carefully consider best methods of work. No one can be a toiler in any special line for a year without encountering experiences that might be related to a fellow-laborer to his profit. We are scattered over a large territory, having widely varying conditions of climate, altitude, and plant and insect life. Each can bring from his particular field some points of peculiar interest to all the others. While we may read one another's publications and perhaps exchange frequent letters until we almost feel acquainted, it is only occasionally that we can enjoy these meetings together, and it is a great inspiration to talk freely over one's experiences and plans of work face to face with those who are interested with him in similar lines of labor."

"The student of applied entomology is supposed to have a good general knowledge of agricultural affairs, particularly in regard to plant growth. He must be informed upon all the insecticide materials and be able to tell what insects they are suited to kill, in what strength they may be applied to different plants, what their physiological effects will be on both plant and insect life, and when they can best be applied. He is supposed to be able to tell at a glance what any insect is that may be handed him, and whether or not it is injurious or beneficial. He is expected to be able to recommend the cheapest and best pumps or other machinery for the application of insecticides. Is it any wonder that we need to get together and exchange experiences and discuss methods of work, particularly when we remember that different results are obtained in different localities? Lime, salt and sulphur, so valuable for the destruction of San Jose scale on the Pacific coast, were found to be of very little value in the moist atmosphere of the eastern portion of the country; the codling moth, said to have one brood in Maine, is reported to have two in Colorado, and three or four in other places; insects fairly common but never seriously abundant in one portion of the country are often found to be great pests in others. In view of these conditions it is important that we obtain all the ideas possible from fellow-laborers in different localities, that we may make as few mistakes as possible, and that we may not bring down upon ourselves the distrust of those whom we labor to benefit."

"We are also 'to consider best methods of work.' Method is always important, and particularly is it to be sought for in a young science or industry where long experience has not yet determined the best plans of procedure. It was well at first that a large amount of individuality should enter into the work and a variety of methods be employed. Then, by a process of natural selection, the poorer methods would gradually drop out and the better ones be retained. It is time for this Association to lay aside its swaddling clothes and assume the garb of maturer years. It should be one of its objects to determine upon best methods as soon as expedient to do so. One recommends Paris green or London purple in the proportion of 1 pound to 200 gallons of water, while another will make it one pound to 160 or even 100 gallons for the destruction of the same insect. One recommends two sprayings for the codling moth, another three,

* The Editor desires to acknowledge his indebtedness to the official report of the proceedings of this meeting published by the U. S. Department of Agriculture.

and another says spray often enough to keep the fruit covered with a layer of the poison, so as to be sure of killing the second brood. Some advise hellebore for the pear slug, while others prefer one of the arsenites, and still another would use quicklime or simply road dust. Surely there is need for more method and uniformity in our work and in our recommendations for the control of particular insects. By free discussions at these meetings much can be accomplished to this end."

The next object laid down is 'to give opportunity to individual workers of announcing proposed investigations, so as to bring out suggestions and prevent unnecessary duplication of work.' "This brings upon us the importance of systematic co operation in our investigations; it has been often urged upon us, but not much progress has been made. One of the chief difficulties is that each one wishes to plan his own experiments and publish the results, in order that he may not have to share honours with another. Such a feeling is not altogether to be condemned; neither is it necessary to so plan our co-operation as to make it essential to remove credit from him to whom it belongs. Let us suppose two entomologists are planning independently to test the effect of insecticides upon foliage. Each carries through his experiments and publishes the results of his labors. They are still independent experiments, the results of one not supporting or contradicting to any great extent the results of the other. Had each known what was being planned by the other, they could have arranged to carry out their experiments so that they would be largely duplications of each other, and when the results were published we should have double evidence upon the points under consideration where results agreed; and where they disagreed, we might be able to find in the different conditions the reason for it. Such a co-operation would bring results of far greater value than those obtained by independent experimentation, and neither party would lose any glory; in fact, each would receive more credit because of the better conclusions that could be drawn from the work. And then how carefully every conclusion would be reached and backed by positive proof for fear that the other party might get different results! Such duplication as this is of the utmost importance to establish scientific truth, and the more we can have of it the better. It is only the 'unnecessary duplication of work' that our constitution deprecates."

"It is frequently the case that one is working out with considerable care the life habits of an insect, and a little information from exact observations upon some particular point in other localities would be of great service to him. The person giving the information would have full credit for what he did, and the world would have the benefit of the combined results. When time can not be taken by the head of a department for this aid, it may often be the case that a special student in entomology would be glad to get his name into a bulletin for doing a little good work. I have a case in mind to illustrate. The speaker is working on the life history of the codling moth. His observations make him wonder how it can be possible that there can be so few as one brood or so many as three or four anywhere. He would be greatly aided if a few entomologists in different parts of the country would make the following observations and report results this year. First, obtain date of blooming of the earliest apple trees. Second, determine the time of appearance of the first moths of the second brood by collecting a few of the earliest wormy apples and rearing the moths from them. Third, determine when the brood of worms that go over winter without pupation begin to leave the fruit. This can be done by placing cloth bands on the trees about July 15th, and removing the larvæ that appear under them once a week until those have been taken that do not change to a chrysalis within a short time. Then, with the other facts that have been well worked out, it will be possible to state with considerable definiteness the number of broods in different portions of the country."

The speaker next referred to the importance of having at each Experimental Station as complete collections as possible of insects in all their stages that are serious pests, and said that the only way in which this could be accomplished was by a system of mutual exchanges. After speaking very briefly on the third clause of the constitution 'to suggest, when possible, certain lines of investigation upon subjects of general interest,' he went on to the last clause, 'to promote the science and advance the study of entomology.'

"The usefulness of any applied science depends upon man's knowledge of the natural laws operating in that science. An astronomer could not determine the very day, hour, and minute when an eclipse of the sun would be visible at a particular spot on the earth's

surface, or the exact date of the return of a comet, if he did not thoroughly understand the operation of the laws by which these marvellous phenomena are brought about. Neither can applied entomology accomplish its highest mission in the world for man's benefit until he succeeds in thoroughly working out and interpreting aright the laws which prevail in the insect world, and they are many and intricate, and some of them difficult of solution. Whatever we can do to interest others in the study of insect life, in any of its phases, to the end that new facts are recorded, will help to the more perfect understanding of our favorite science and consequently to its usefulness. We are greatly indebted to the pure systematist in entomology who never attempts to make a practical application of his knowledge."

"It would greatly promote the science of entomology if each member of this Association would make a special systematic study of some groups of insects, however small, and publish the result as a personal contribution to the pure science of entomology. We would be better workers in economic problems for so doing. A study of the habits of insects in nature's laboratory fits one for a grade of systematic work that he never could attain as a closet naturalist."

"A knowledge of food plants, of broods, of local variations, and of variations occurring among the offspring of a single pair, determined by careful observation in nature's haunts or by breeding in the laboratory, is as essential to enable one to establish true specific differences as is a thorough knowledge of structural character."

"To promote a science it is necessary to make known its relations to human interests. If men can be shown that their health, wealth, or happiness depends upon a knowledge of insect life, there will be no trouble to interest people in the study of entomology. Show the farmer, the gardener, and the horticulturist the importance of knowing the habits of insects in order to successfully combat the pests that destroy their crops; bring to the attention of the preacher the inexhaustible fund of evidence and illustration with which to teach his flock the power, wisdom, mercy, care, and omnipotence of the Creator of all; make known to the artist the boundless field which a study of insects opens to him for the display and development of his powers in portraying graceful and fantastic forms and in preparing and blending colors of the most exquisite beauty and harmony; teach those that instruct the young what a wealth of interesting and easily obtained objects are always at hand from insect life with which to fascinate the child and secure his lifelong interest in natural history study; make it plain to all that the very laws of life that prevail in the higher realm are equally patent among the creeping, crawling creatures of lower rank and smaller size—do all this, and the science of entomology will quickly take the rank it deserves among its sister-sciences."

"In closing let me urge that we keep in mind the worthy objects for the promotion of which we are banded together. Let us keep the standard of work up to the ideal conceived by those in whose minds the organization had its birth. Let us show a willingness to sacrifice self-interest when it is necessary for the general good, and let us do all in our power to preserve and strengthen the fraternal feeling that has ever existed among our members."

In a subsequent discussion of the address, Prof. Webster said that there were very many features in it of vital importance to working entomologists. One thing he considered entitled to especial emphasis and that was the matter of duplication of work. The fact that one member was working upon a given species in one State or Province and another member was working upon exactly the same species in another region of country, while apparently a duplication of work is not really so, because in all probably very different results would be obtained. No two men see the same thing in the same light, and climate, latitude and elevation also have a great deal to do with the action of insects. As to the matter of mapping out work, it must be remembered that most entomologists are limited in their powers, and, while they can plan work, it is not always easy to carry it out, as a station director or a board of trustees might greatly revise his plans. In regard to the introduction of foreign parasites, it seemed to him that it is a field we are just entering, with the future all before us, and there would be many failures; but where such work was carried out carefully he believed it might prove successful with respect to a great many introduced species of insects. When we come to carry it out between States, how

ever, other difficulties will surround us. He went to a great deal of pains to obtain from Professor Morgan an egg parasite of *Murgantia*, and after getting it established, it was swept out of existence during the winter of 1898-99, and no good has come from the introduction. He was also of the opinion that a great deal could be done by an exchange of experiences with insecticides, such as had taken place in the morning session, as insecticides seldom have the same effect in different portions of the country. It had always seemed to him that the work of the economic entomologist was very largely to work out life histories, and after he had done this and had found out methods that could be used to destroy the insect his duty ends and the work of the horticulturist and agriculturist begins. He did not think it ought to be necessary for an entomologist to make of himself a mechanical, hydraulic, or civil engineer.

Prof. Fernald referred to the remark just made by Mr. Webster to the effect that no two men saw the same thing in the same light, and said that the same was often true in listening to an address, for generally no two men got the same ideas from it. For him other parts of the address than those mentioned by other speakers had presented themselves with particular force, and especially those with reference to collections in connection with the insectary or entomological work of any kind. It seemed to him that the work of a station whether connected with a college or not, is most emphatically educational, for even if it be not educational to students or visitors, it is certainly educational to the workers at the station themselves, and by continually adding to such a collection they are adding to their education as well as to the education of the residents of the region. He had thus far found a great demand for collections rather different from those ordinarily met with. The ordinary collection contains the rare insects as frequently as it does the destructive ones, and by that he meant to uphold the question that was raised in the address with reference to how many of the common insects could be found in different collections. He suggested that, so far as his own experience goes, there are too few collections in which all stages are preserved in connection with the work that insects do. A large part of the material that he receives in Massachusetts does not contain any insect whatever, but simply a sample of the work of the insect which has either escaped from the box or was never inclosed. The problem in such cases is to tell what has done the damage by the damage itself. He found that his greatest help was to preserve specimens of the insect and of the work it was doing, and he used such specimens in the identification of material sent in, perhaps fifty times as often as any other specimens. Our collections, in his opinion, should be amplified along the lines of early stages and the work done by the insects, and such collections will appeal strongly to the people. The whole address was interesting and suggestive, but it was this feature which interested him most. He had also had experience with the *Murgantia* parasite obtained from Louisiana by the kindness of Mr. Morgan, and while he was now fortunate in not having *Murgantia* to deal with, it was a great relief, while searching around, to find that there was some one who could assist him, and he thought anything in that line should be encouraged, for when a man wants a thing of that sort he wants it badly.

Mr. Johnson said there was another important suggestion implied in the address, and that was the commercial side of entomology—if the term might be permitted. We have enough systematic entomologists at the present time, and perhaps enough economic entomologists, but we do need another lot of men who will take up purely the ecological side; that is, they must study conditions in the field. The day is coming, and is not far distant, when our great commercial railroads and some of our greatest manufacturing concerns, such as canneries, will employ ecological entomologists just as they employ engineers and other skilled labor. He felt quite certain that this would come about, and that a new field would open to young men especially, who would take up this commercial side of the entomological problem. To give an illustration of what he meant, he said he would try to bring this out in a paper which he would read on the following day on the subject of the pea louse in Maryland, which has destroyed more than \$4,000,000 worth of green peas along the Atlantic coast this season.

When insect injury touches the pockets of the producers to that extent they are going to look about for the men who have a knowledge of the insects. It means money to them. He had been in consultation with some of the high officials of one of our principal railroads, and felt certain that the day is not far distant when these roads will employ men to take up the entomological study and development of the territory through

which their lines run. He considered this an important point for the student of entomology to bear in mind. Of course such a man must go out and study conditions over a vast area. He must also know what our worthy chairman is doing in Colorado; what Mr. Weed is doing in New Hampshire; what Mr. Lounsbury is doing in South Africa; what Dr. Fletcher is doing in Canada—in short he must keep posted on the entomology of the whole world and be ready to meet any emergency.

Prof. Hopkins said that he found in the spruce forests of Maine that a large timber concern controlling some 300,000 acres employed a practical forester and scientific man, and paid him about \$1,500 a year, to give advice on practical methods of cutting timber and making surveys. The concern mentioned sent this man with the speaker through the spruce forests of Maine to learn all he could about forest insects. This was another evidence of the fact that the practical men are beginning to realize that they can very profitably make use of the results of scientific research.

A vote of thanks to the chairman for his interesting and suggestive address was unanimously adopted.

Dr. L. O. Howard, in the first paper, detailed the operations performed in the introduction and establishment of the *Blastophaga* in the fig plantations of California, which had been carried on since the last meeting. The paper will be published in full in the Year-book of the U.S. Department of Agriculture for 1900.

ESTABLISHMENT OF A NEW BENEFICIAL INSECT IN CALIFORNIA.

A second note presented by Dr. Howard also related to the introduction of a beneficial insect. He stated that it would perhaps be remembered that at the tenth annual meeting of this Association he had referred to his efforts to introduce and establish in this country, with the assistance of Prof. Antonio Berlese, of Italy, the interesting Oriental parasite known as *Scutellista cyanea*. In Italy this curious parasite occurs commonly in the wax scale (*Ceroplastes rusci*), and it was introduced into Italy in all probability from the Orient about forty years ago, although originally described by Motschulsky in 1859 from specimens reared by Nietner in Ceylon from *Lecanium coffee*. The living specimens were sent by Dr. Berlese and his colleague, Dr. Leonardi, and were colonized at Baton Rouge, La.; also in Washington D.C., in the insectary of the Division of Entomology upon *Ceroplastes cirripediformis*. The Washington specimens did not succeed in perpetuating the species and nothing has been found since of the Louisiana material. A year later Mr. C. P. Lounsbury, government entomologist of Cape Colony, found this species parasitic upon *Lecanium oleae*, the common black scale, in Cape Colony, and sent specimens to the writer for identification. The past spring, Mr. Lounsbury, at the writer's request, made formally through the United States Secretary of Agriculture to the Secretary of Agriculture of Cape Colony, brought with him from Cape Town to New York two boxes of twigs covered with the black scale affected with this parasite, and expressed them to Washington, whence they were immediately forwarded to Mr. E. M. Ehrhorn, the horticultural inspector of Santa Clara County, Cal. On June 19 the writer received a letter from Mr. Ehrhorn announcing the arrival in living and healthy condition of the parasites in question. The twigs in one box were somewhat mouldy but quite a number of parasites were crawling about in the box and were found in the pupal condition in some of the scales. Mr. Ehrhorn had been warned by telegraph and had prepared twenty-five infested oleander plants by potting them and had covered each with a tight bag of the finest Swiss muslin. In these most of the parasites were liberated and a few were allowed to fly in the orchard. Specimens of a hyperparasite (*Tetrastichus* sp.) also survived the journey, but Mr. Ehrhorn was on the lookout for this parasite and isolated them as they appeared, pending instructions from Washington as to their destruction. The writer had strong hope of the successful establishment of this species at San Jose, the climate being appropriate and the supply of food unlimited, and stated further that this was another instance of international entomological work which emphasized the fact that this Association through this class of work binds together its members all over the world more than any other association.

At the opening of the discussion on the paper, Dr. Howard said that he would be glad to hear from Mr. Lounsbury on the subject of this parasite of the black scale. He

said he wished to add that Mr. Lounsbury had sent two boxes, one a deep box and the other a shallow one. The shallow box carried the more successfully; the scales had begun to rot in the deep one.

Mr. Lounsbury stated that the history of the case dated back to his first arrival in Cape Colony. Before he had been there a year he noticed that the black scale was not injurious, and upon travelling about the Colony he found the same condition true over many thousand miles of territory. Later, upon obtaining specimens of the parasite and corresponding with Mr. Howard on the subject, the latter had suggested his sending it to California. For four years he had been watching for an opportunity to get a sufficient number of parasites to send, but the scale is so well kept in check by the parasites or by other factors, that until this year he was unable to find a large quantity. Last year he mentioned the matter in his annual report; a copy of which he had sent to Mr. Ehrhorn, who at once wrote and asked him to take steps to get the parasite established in California. He replied that he would gladly do all he could, but would like Mr. Ehrhorn to make it a formal matter so that he might be able to spend the time and money necessary. This was done and Mr. Lounsbury received formal orders to go ahead. He set about it in two ways: First, he had scales collected and reared young larvæ from them, which were placed on young oleander trees now being kept in the Cape Town gardens. Primary parasites were to be admitted to the plants, but secondaries excluded. These plants in time he may be able to send to the United States in Wardian cases. Second, while waiting for these to develop he had Mr. Mally go out and search the country side, with the fortunate result that relatively large colonies of scale were found where Mr. Lounsbury had seen small colonies the year before. Mr. Mally collected for nearly a week and brought in over a bushel of twigs which were carefully sorted, cut into foot lengths, and the ends dipped into sealing wax. The twigs were then wrapped in tissue paper. The matter of the differently shaped boxes was purely accidental. He went to the grocery shop and picked out what he thought would be best suited, taking one shallow box and one deep box in order to try them. He thought that packed in the manner above described and placed in a wooden box, what moisture came would be absorbed by the wood. The boxes were packed the night preceding Mr. Lounsbury's departure, the deep box being placed on a tray, and in the fruit room of the Cape steamer and the shallow box kept in the storeroom. In this way the insects were taken to England, which he hurried across and took the next liner. He then tried to get the box which he had kept in the fruit room also placed in a cool room on the New York steamer, but found no choice between putting it in the cargo room or leaving it outside. He preferred not to freeze the insects because the parasites, not being accustomed to such temperature, might succumb, and he therefore placed the box in an empty cabin below the water line. The voyage was fortunately good, the temperature averaging about 60°. The shallow box was kept in his stateroom, as on the Cape steamer, and immediately upon arrival in New York both boxes were shipped to Dr. Howard. They arrived in New York in 25 days from Cape Town, a quick passage which, perhaps, could not be repeated.

On being asked if the black scale in South Africa is destructive to citrus trees to the same extent as in California, Mr. Lounsbury replied that he had seen citrus trees infested in only about ten places in the last five years, and never more than a few scales at any of these places. Occasionally he had seen the scale on citrus trees from Natal or from Australia which had been imported to the Cape. One orchardist having several thousand trees, said he had seen a few on his Australian trees, but they had disappeared. He himself was unable to find any there after a year from the importation. It is not known of what country the scale is a native, but it must have been in Cape Colony for many years. It occurs most commonly on oleander, which at the Cape is an outdoor plant, and *Myropanium*. He had found it 150 miles inland and on numerous indigenous plants away from settlements.

TRANSMISSION OF PARASITES.

A conversation on the subject of the transmission of parasites from one region of country to another then followed. Mr. Johnson said that he had recently received a request from Mr. Ehrhorn of California, for parasites that prey in the East on the imported cabbage-worm. It seemed to Mr. Johnson that this was a matter for co-operation,

and he merely mentioned the fact as a suggestion from Mr. Ehrhorn that it is very desirable to establish such parasites in that section. He had promised to do what he could from his end of the line, and he hoped that others who were fortunate enough to possess such parasites would also assist. He had also received a request from Professor Morgan for specimens of the parasite which he had bred and which Mr. Howard had named. Professor Morgan is anxious to colonize this parasite on *Murgantia histrionica* in Louisiana, and Mr. Johnson had promised to send him parasitized eggs of the harlequin cabbage bug at the earliest opportunity, but up to the present time had been unable to find any specimens of this destructive pest. Three years ago it was one of the most destructive insects in the Maryland and Virginia cabbage-growing sections, but since the freeze of February, 1899, he had seen very few specimens. He was unable to say whether this was due entirely to the freeze or to the parasites. The parasite is a new species (*Encyrtus Johnsoni* Howard, Can. Ent. Vol. XXX, pp. 17, 18) and there seems to be some promise of its successful introduction into the South.

Mr. Gillette said he considered the matter of parasites one of great interest, and he hoped the subject would be further discussed. In Colorado nature often seems out of balance. There are a number of species which are not abundant in the East, but which are very injurious in Colorado, and he thought it was because the parasites have not been carried to that section of the country. In his opinion it would be of the greatest benefit to certain portions of the country to introduce insect enemies, both parasitic and predaceous.

Dr. Howard said he desired to call the attention of the members of the Association to the fact that this was the most representative meeting of the Association ever held. Not only was Mr. Woodworth, of California, present, with Mr. Fernald, of Massachusetts, Mr. Weed, of New Hampshire, and Messrs. Quaintance and Scott, of the Southern States, but also "our dear old friend," Mr. Fletcher, of Canada, and Mr. Lounsbury, who had carried American economic entomology clear across the Atlantic Ocean to South Africa. Mr. Currie, the under secretary of agriculture for Cape Colony, who was recently visiting Mr. Howard in Washington, had said that he was very glad indeed that he had sent for an American entomologist to come to the Cape, and congratulated his department upon being able to secure such a man as Mr. Lounsbury.

Dr. Howard presented a third note in which he gave an account of the useful work performed by the larvæ of a little lady-bird beetle, *Hyperaspis signata*, in destroying the scales on maple trees, *Pulvinaria acericola*, and also those of *P. innumerabilis*. These larvæ very much resemble the scales on which they feed.

Mr. E. P. Felt, State Entomologist of New York, read a paper on

SOME EFFECTS OF EARLY SPRING APPLICATION OF INSECTICIDES ON FRUIT-TREES.

He said that a series of tests had this spring been begun near Albany, N. Y., with the object of ascertaining the best method of controlling the San Jose Scale in orchards. During the progress of the work trees were treated with mechanical mixtures of water and kerosene, and of water and crude petroleum, using 20 and 25 per cent. of the oils and applying with a kero-water sprayer. A few trees were treated with undiluted kerosene and others with undiluted crude petroleum; a number of trees were also treated with caustic potash whale oil soap, at the rate of 2½ lbs. to a gallon of water, and some with a combination of the soap and crude petroleum in the proportion of one pound of soap to four gallons of water, and one gallon of the oil to ten gallons of the soap solution. The spraying was mostly done on April 11th and the work was performed in a mixed orchard of over 100 young pear, peach, plum and cherry trees, where the San José scale had been for about eight years, and the trees, therefore, presented every degree of infestation. The undiluted kerosene and crude petroleum were applied to the worst infested trees.

The spraying with the insecticides occurred just before the buds began to open, and with the exception of the trees treated with the undiluted oils very few or no harmful effects were observed. Eight days after spraying, the trees as a rule were budding out. Those treated with kerosene gave little indication of the presence of the oil on the bark, while the dark colour of those treated with crude petroleum was very apparent, a condition which still continues at the time of writing, June 20th. The whale-oil soaps showed to a considerable extent. Photographs were exhibited showing the harmlessness of

mechanical 20 per cent. emulsions of either kerosene or crude petroleum, also of similar 25 per cent. emulsions. Other photographs showed positive injury from the use of undiluted kerosene, and most marked injury from undiluted crude petroleum; one plum tree was killed outright by the latter treatment.

Experiments undertaken in other localities also served to show that crude petroleum may seriously injure trees under certain conditions. The trees may eventually outgrow the harm, and it is possible that the injury may be no greater than the scale would have caused, if allowed to go unchecked. The mechanical dilutions of crude petroleum, at least up to 25 per cent., appear to be harmless if applied before the buds are open, and it is to be hoped that they will prove effective in controlling the scale.

A general discussion followed the reading of Mr. Felt's paper. Mr. Scott said that in Georgia undiluted crude petroleum killed peach and plum trees outright, but 50 per cent. and less strength did very little damage. The best results were obtained with 25 per cent. in mechanical mixture with water sprayed with a Gould kero water sprayer. The application was made just before the fruit buds opened in the spring; all the insects reached by the spray were killed, according to notes made up to June 12. Until that date the sprayed trees remained oily and the odor of the crude petroleum could yet be detected. It is a reasonable conclusion, then, that the scale can not live so long under such a coating of oil. He had concluded that the 25 per cent. crude petroleum in mechanical mixture was better than refined kerosene of the same strength.

Mr. Woodsworth said that when the bulletin from the New Jersey station came out it was heralded all over California, and he had to write more letters in regard to the kerosene and crude petroleum treatment than about any other insecticide. Crude petroleum in California is a very indefinite term, since there is a crude petroleum from Ventura which is as thick and black as molasses, and from that it varies to crude petroleum which is almost as thin as gasoline. Even in a single well the product varies according to depth and age, and distillations show that it varies greatly in composition. He had been assured that the Eastern product varied also, and was of opinion that before we can recommend any percentage of crude petroleum we will have to establish a criterion of excellence. The different kinds of crude petroleum he had experimented with in California produced very different results—strikingly different. There is also a very decided difference in results according to time of spraying with the same oil. Thus spraying before rain and after rain may produce entirely different results. He had sprayed with some forms of crude petroleum without injury which would have thoroughly destroyed the foliage at another time of day. The amount of water in the leaf may determine to a certain extent the damage by the oil. It seemed to him, therefore, that another thing that must be done before we can really properly understand the action of the oil will be to study the effect of the oil upon the vegetable tissue. Perhaps this had already been done, but it was still in large part a mystery to him.

Mr. Webster said he had used oil from two wells located in different parts of Ohio this year, and although the analysis ran almost exactly the same in each case the effect has been different. In the one case he had not seen the orchard for several weeks, but when he last saw it the peach trees seemed to have been in many instances killed by the use of crude petroleum. He could not say whether the oil had been applied just before or just after a rain. In the other case the trees sprayed were seedling apples on the experiment farm, the experiment being made to determine if possible the effect upon the trees and not against insects. Some of the trees leaved out at the proper time about as freely as usual, while others had no leaves at all. At the present time, however, there was no apparent difference whatever in them, all having finally leaved out precisely the same. It was evidently nothing but a temporary injury. His experiments had produced such various results that he was badly mixed up and did not favour recommending the use of kerosene of any sort. He was of the opinion that the variation would be just as great in the crude article as in the refined.

Mr. Hopkins said that in West Virginia they have a great variety of petroleum, from that as thick and black as molasses to the thin light-coloured product. The oil obtained from the Standard Oil Company is a mixture of all kinds except the heavy oil. The heavy oil is used for lubricating machinery. He had obtained some results which are quite at variance with the testimony of others and show what conflicting results can be obtained in different States. In one case he recommended crude petroleum as an experi-

ment in a large orchard which was almost dead from the scale and which the owner refused to cut down. It had been sprayed once with pure kerosene, which did some damage and killed many scales, but the owner had allowed it to go without treatment and the scales had again covered the trees. He sprayed it with crude petroleum obtained in Baltimore. When he last saw the orchard, in April, the trees were black and greasy, but underneath the bark they were as healthy as ever, the leaves were coming out in full, and the owner claimed that the crude petroleum had benefited them. He was not recommending the oil, but simply giving this as an example. His spraying was done in February and wherever the oil touched the bark it remained dark and greasy for months afterwards. A thorough examination failed to reveal any of the living scales, and he believed that the young scales could not settle and live on the oily surface. He felt very much encouraged. It is one of those problems which require co-operative work. As a result of further investigation, he thinks it may become one of the best insecticides ever discovered. He could not think of any better work than trying to find the reasons for the great difference in results in experimental work with insecticides.

Mr. Webster said he was unable to see what could be gained even if crude petroleum should be perfected. It was true that we will have to get something cheaper and more effective than whale-oil soap, which if used on peach trees except during the winter will destroy the fruit, but in view of the difficulty he had had in getting crude petroleum and the high price asked for it, how much better an insecticide than whale-oil soap would we have even if it was perfected? He thought that entomologists who cared for their reputation would experiment much and say little for publication, for the present at least. He further stated that while experimentation was always in order, it would be best to stick to the whale-oil soap until more obscurities in regard to the use of petroleum had been eliminated.

Mr. Johnston said he agreed with Mr. Webster. We have got to get something better than kerosene for both peach and plum. In one instance he had sprayed an orchard of two hundred 9-year old peach trees in February with 25 per cent. kerosene and not a tree was living on the 28th of April last. It seemed to him that atmospheric conditions were at the bottom of the difficulty, and he thought it would be necessary to go back to the old whale-oil soap remedy, which destroyed the scale more effectively and was less liable to injure the trees. It would not be wise to substitute crude petroleum for whale-oil soap. After three years experience with the soap, kerosene and gas, he was of the opinion that there are other conditions which must be studied more seriously in the future than in the past, and he heartily agreed in the opinion that co-operation is desirable. He believed it would produce better results in the future. We must not confine our labours to the territorial boundaries of a State, but go outside for information, suggestions and experiences of others.

Dr. Fletcher remarked that he was glad to hear what had been said about whale-oil soap and crude petroleum. He had never yet been able to see what object there was in trying to use petroleum. The results were far too conflicting and always unsatisfactory, and the question of cost in the ruin of apparatus was never considered. There was very slight injury to the hose in the use of potash whale-oil soaps, which could now be obtained of pretty uniform manufacture and had been giving good results. These are always to be had, and are easy to get in most places, while he had found great difficulty in getting crude petroleum. He thought there was room for experiment with much weaker mixtures of the potash soaps during the summer. His experience was in favour of these soaps in preference to either crude petroleum or kerosene mixed with water. Even with the kerosene emulsion there is sometimes unexpected injury to the trees, which was always put down to difference in the oil or in the water. He was satisfied for the present that the whale-oil soap was the safest remedy, and it was the best for those who are official entomologists, who have to recommend formulæ to people who will make a mistake if they possibly can.

Mr. Sanderson related his experience with crude petroleum, which was favourable to its use. He had sprayed a pear orchard on the Delaware river with it in the latter part of January, on a cloudy day, followed by a little hail and rain soon afterwards. Two months later he sprayed another lot of 100 trees with a 25 per cent mixture; it was a very windy day and almost all the trees previously sprayed got a dose of the 25 per cent.

mixture on one side. Examination shows no injury on either lot. Here and there could be seen a tree not doing well, but that was owing to the spray of a year before with pure kerosene. The buds were not injured. The growers in his region never use whale-oil soap, because it destroys the buds. They have used it during midwinter and it destroyed buds, and have now given it up.

Mr. Woodworth said that he did not wish his former remarks to be construed to mean that there is no future for crude petroleum as an insecticide, but he desired to emphasize the fact that there is a great deal to learn. In some of the large orchards in California crude petroleum has been used with success, but not against the San Jose scale. He is of the opinion that there is a great future for crude petroleum, and that the time will come when it will be cheaper in the East. In California it is the cheapest insecticide that can be bought.

Three papers were read by Mr. Clarence M. Weed on "The oviposition of an egg parasite of *Vanessa antiopa*"; "The oviposition of *Cacœcia cerasivorana*," and "The relation of *Pimpla conquisitor* to *Clisiocampa Americana*." The last-named insect (*Pimpla*) is the most important parasite which attacks the pupa of the apple-tree tent-caterpillar.

HYDRO-CYANIC-ACID GAS.

The reading of a paper by Prof. Fernald on "The Marguerite Fly," which he has retained for publication elsewhere, led to a discussion regarding the use of hydro-cyanic acid gas.

Replying to a question from Mr. Johnson, as to whether hydro-cyanic acid gas had been used, Prof. Fernald stated that there was objection to the use of this substance among florists, who have an exaggerated idea of the danger involved and will not often use it. He had no doubt hydro-cyanic-acid gas would be more effective, but thought the florists would prefer to use carbon bisulphide, as this substance had proved satisfactory.

Dr. Fletcher thought that remedial work against the flies during the winter would be better than work against the larvæ after they have eaten the leaves.

Prof. Fernald replied that the problem had been thus far looked at by him entirely from the florists' standpoint, and the insect treated in the stage at which the florists would first see it and want to treat it. He was certain, however, that the fly could be handled by fumigating the greenhouses.

Mr. Johnson stated that one could not be too careful in the use of hydrocyanic-acid gas, and he wanted to caution all those who used it. In one instance, after preparing the chemicals necessary for generating the gas, he thought he would take his chances in dropping the cyanide in the jar and get out, but he felt the effects of the gas almost immediately. By the time he reached the door a haze came over his eyes, everything looked black, and a feeling similar to blind staggers overcame him. Experience has proved that it is not a trifling matter, and he would caution all who had occasion to use the gas. At the same time he felt that hydrocyanic-acid gas was the coming material for the destruction of certain insect pests in mills where stored grain and other products become infested. He had recently performed one of the largest experiments ever undertaken in the use of hydrocyanic acid gas, in a five-story brick mill in Canada. Over 150 pounds of potassium cyanide was discharged in the mill, and the results were very gratifying. It practically eliminated the flour moth from the mill.

Dr. Fletcher said he did not think enough care could be taken in giving instructions when recommending hydrocyanic-acid gas for general use, especially in this stage of introducing it, as a fatal case or two would put an end to its use entirely. Several striking instances had lately been mentioned which show the intensely poisonous nature of this gas. Much more care, instead of less, than has been exercised in the past is necessary. With regard to the use of bisulphide of carbon, he certainly was not satisfied with its use in mills and had not got the results promised for it. He was very sorry Mr. Marlatt was not present at the meeting, as his *laissez-faire* policy had given him a lot of trouble with the people he had to deal with, and he was of the opinion that some others of the Association might have liked to discuss that matter somewhat.

Mr. Webster stated that his fumigating houses in Ohio are covered carefully and made perfectly air tight by the use of layers of building paper, but if the ordinary nurseryman makes his own fumigating house he would not make it any more air-tight

than a hencoop. He had tried almost every way of introducing the cyanide, but the man who did the work invariably complained of severe headache, until he devised a method of combining the mixtures under the floors.

Mr. Lounsbury suggested that a simple way was to have a small lead tube leading from the outside of the house, the vessel containing the cyanide being placed under the tube, the door closed and locked, and the water and acid freshly mixed being poured in through the little funnel or tube and the aperture closed.

Mr. A. L. Quaintance of the Georgia Experimental Station, read the next paper on *Diabrotica 12 punctata* which is a serious pest to corn in the Southern States. The injury to the plant is confined almost entirely to the work of the larvæ on the underground portions of the plant, as the roots and stem below the surface of the soil. The attack is mainly in the spring while the plants are quite young. The writer gave an account of the life history of the beetle and the experiments that had been made with a view to its control. He found that if eight to ten grains of corn be planted in each hill, the plants would not all be destroyed, and the injury from this Southern corn-root worm would be practically avoided, or so distributed that the damage would be trifling.

Mr. C. P. Lounsbury gave a long and very interesting account of his observations on the habits and associations of a number of species of Ticks that cause great annoyance and much injury to live stock in South Africa.

Mr. W. M. Scott presented a paper on the Coccidæ of Georgia in which he enumerated 41 species of scale insects that he had found in the State, and gave their localities and food-plants.

On Saturday morning, June 23rd, the Association met in joint session with the Society for the Promotion of Agricultural Science, the President of which (Prof. Beal) read his annual address. Dr. L. O. Howard gave an account of the progress of Economic Entomology in the United States, which is published in the year-book of the U.S. Department of Agriculture for 1899; and Mr. C. P. Gillette read a paper entitled "Apiary Notes."

NOTES UPON THE DESTRUCTIVE GREEN PEA LOUSE FOR 1900.

(*Nectarophora Destructor*, JOHNS).

BY W. G. JOHNSON, COLLEGE PARK, MD.

Perhaps no insect in recent years has attracted more attention than the destructive green pea louse. It became conspicuous, first, on account of its ravenous attacks upon the pea fields, a crop heretofore practically immune from the ravages of insects; and, secondly, from the fact that it was a species not recorded in science. What condition in nature was responsible for such a general distribution of a new species of insect the writer will not attempt to discuss in this short paper. It appeared last year, and was recorded for the first time, from Maine along the Atlantic coast southward to North Carolina, and westward to Wooster, Ohio. It was also observed in Nova Scotia and Ottawa, Canada. I had it sent to me from Massachusetts and Vermont in July and August, and complaints of its serious nature have come to me from Chillicothe, Ohio, Long Island, N.Y., portions of New Jersey, and Wisconsin (August). I first observed the pest May 18, 1899, and have had it under constant observation from that date to the present writing. I described the newcomer in the February issue of the Canadian Entomologist as *Nectarophora destructor*. A very long name, I admit, but if there is anything in a name being a burden to its possessor, we hope that this one will accomplish such a purpose.

From the first I have held that this insect is probably a clover pest. It has been observed upon both red and crimson clover, and this season hundreds of acres of red clover have been destroyed by it. In one instance, reported to me June 13, Mr. O. Silas Thomas, of Lander, Frederick County, Md., stated that the pest had almost entirely ruined 65 acres of red clover for him. Many other cases of a similar nature were reported or observed by us. The attack has been very common upon crimson clover also, but I have not heard of a field being killed by it. That clover, and perhaps the red clover, is

its original food plant seems quite conclusive from our experiments and observations. I am of the opinion that red clover is its original food, and that it is, therefore, primarily a clover pest. Without doubt it is a native American insect, and has spread its attacks to crimson clover and field peas, as these two plants have encroached upon the feeding ground of the louse. It spends the winter, at least in the South, as an adult in clover fields. It may winter in another form farther north.

It is barely possible that this insect has other food plants and lives over winter upon them, but clover is, no doubt, the main plant upon which it lives. Mr. F. H. Chittenden, of the U.S. Department of Agriculture, Division of Entomology, in Washington, observed this insect, or one very closely allied to it, feeding upon a number of species of vetches in Washington this year.

From a long series of experiments in the laboratory we have shown that there are two kinds of females known at present, the winged and wingless forms. No male has as yet been discovered, and perhaps in the South none exists, and the insect remains over winter in the adult stage, as stated above, upon some plant, and in most instances this is clover. The female produces living young which reach maturity in from ten to fifteen days, and possibly less time in hot weather. As an example, a young one born March 4 reached maturity (winged form) March 16, or 12 days from time of birth, and was producing living young on March 19. From that date to April 17 it became the mother of 111 young and then died. Her first young (wingless form), born March 19, reached maturity and was producing on March 31, or eleven days from time of birth; from that date to April 13 she gave birth to 120 young and died. We have made many other observations of a similar character, but this will suffice to show the rapid reproductive powers of this insect, and we might state that in many instances where this insect was first observed on May 1, three weeks later the fields were abandoned on account of its attacks. Calculated from the average number of insects produced per day (which is 6), in six weeks one would become the progenitor of 423, 912.

It was estimated last year that the total loss from the attacks of the creature along the Atlantic Coast States was \$3,000,000, and that the crop was only one-half the usual output. From information obtained from the largest growers, the most experienced seeds men, and most extensive dealers in this line of business, "The Trade," a canned goods journal published in Baltimore, has gathered the information that the crop of peas of the Atlantic Coast this year will not exceed, on the outside, one-third of what it was last year. This is about as serious as it can be, when it is taken into account that it is mostly due to this one pest, and that it is certain to increase its destructive powers from year to year, unless some factor in nature intervenes to check and retard its further development. With this condition of affairs it is not strange that farmers have become thoroughly discouraged and make the statement that they will be more cautious about planting peas for market purposes, or for the packer, in the future.

With this year's experience, however, we have shown conclusively in our experiments and practical works in the field that this insect can be kept in control to a very great extent if taken in hand in time. In the first place, the peas must be planted in rows 24 or 30 inches apart, and not broadcast or in drills, as has been the case over a wide area throughout many of the Southern States. As an illustration of this we may cite an instance on the place of Mr. C. H. Pearson, a large packer of Baltimore. His 600 acre pea plantation was practically saved by persistent and energetic efforts on his part this season. All the methods from a practical standpoint were tried on this place, and it was found that the brush and cultivator method was the most effective. Forty men were therefore engaged to work in the field, and the 600 acres were brushed and cultivated every third day for a period of two weeks, and in this manner the entire field was saved, netting the owner from 25,000 to 30,000 cases of peas of 2 dozen each. It is a fact which is not questioned by those who are familiar with this plantation that had not this persistent and energetic fight been followed, the greater portion of the peas would have been destroyed by the insect. Last year the peas over the same area were broadcast so there was no opportunity of fighting the pest, and as a consequence 480 acres were entirely ruined by it. This year, by changing the method, and by a new system of fighting the pest, the peas have been saved. Many other illustrations of a similar nature could be given where we have been following this method persistently in this State.

The brush and cultivator method is a simple one; a good pine switch is used to

brush the vines backward and forward ahead of the Iron Age cultivator, drawn by one horse, and in this manner the insects are covered and a very large proportion of them destroyed. The cultivation should not be repeated until the third day, as it requires usually something over forty-eight hours for the destruction of the adult insects when covered with earth. On this plantation we also sprayed a large acreage to show the practical side of this work. Suffice it is to say that we have found that no spray can be used which can destroy a percentage of insects large enough to warrant the expense of the operation. In this instance we sprayed 100 acres in two days, and thoroughly tested the method from every standpoint, using various materials. We abandoned the spraying apparatus, and began the brush and cultivator method, which was followed up persistently, with the results already noted. We have also used the "brush and pan," in which a bushel of lice were caught to each row of 125 rods long.

Many natural enemies, such as parasitic and predaceous insects, have been found feeding upon this pest in the fields, and in this manner, no doubt, the number has been somewhat reduced. The most important factor, however, we have observed in the destruction of this pest has been the fungous disease, *Empusa aphidis*, which was common during the early part of the season upon this insect, in both clover and pea fields. It is a contagious disease and destroys the pest in very large numbers, under certain conditions. In one instance we found 58 dead lice upon the undersurface of a single lobe of a clover leaf, and it was not an uncommon thing in June to find 15 or 20 dead lice upon the under surface of a pea leaf. With the rains which prevailed throughout this section of country during June, which fostered the development of the disease, it spread rapidly throughout the infested fields, and as a consequence it was very difficult to find the pea-louse upon late peas. A careful examination of peas where the insects were abundant in June showed that they were practically free from them. We feel, therefore, that the climax, as far as the development of the insect this season, has been reached, and that these silent factors in nature are now actually reducing the pest to such a point that it may possibly be several years before it will be such a destructive pest in this section as it has been for the past two seasons. At any rate, the conditions are such that the farmer and canner have new hope, and we trust the future will bring fewer lice and more peas.

In discussing the paper, Prof. Hopkins enquired whether the insect were possibly an introduced species, and if there were any records of its previous occurrence in large numbers.

Mr. Johnson replied that, in his opinion, it was not an introduced pest, but an indigenous insect, which had multiplied enormously from the change of conditions. The only record he had regarding it was one made ten or twelve years ago by Mr. Beckwith at the Delaware station, and another of its occurrence along the Potomac River in 1887. In neither case, however, was it certain that it was the same insect, as no specimens had been preserved. The pea-growers state that the insect has been known to them for many years.

Prof. Hopkins said that this case is such a complete parallel to the invasion of the pine-bark beetle, the trouble from which is now over, that it occurred to him that in this case, within the next few years, this insect will probably disappear or become exceedingly rare. He had taken the trouble, in connection with the investigation of the pine insect, to look up the history of invasions by indigenous insects, and found that they multiply rapidly for several years, become enormously destructive, and a few years later disappear. They are destroyed by parasites or by climatic conditions and soon become rare species. This happened in the case of the pine insect, which was scarcely heard of before, and was one of the rarest insects in collections until it suddenly occurred in 1891 in such enormous numbers as to destroy millions of dollars worth of timber, but now it is practically extinct. Not a single living specimen has been found since the fall of 1892. Prof. Johnson's paper shows the great importance of the work he has undertaken, and his experience will be of inestimable value in dealing with future outbreaks of the pea louse. He thought the farmers of Maryland would make a great mistake by changing their locations for growing peas until perhaps a year had elapsed, because if the rule follows in regard to sudden invasions by indigenous insects they will soon disappear or become rare.

Mr. Johnson said he was greatly obliged to Mr. Hopkins for his opinion, but there is so much money at stake that the growers could not let the matter rest awaiting nature's

relief. He believed fungous diseases, especially *Empusa aphidis*, are one of the factors which will bring about the temporary disappearance of the pest.

Mr. Galloway said the point in regard to the appearance and disappearance of forms holds good in fungous attacks also, the most striking example being the potato blight. The same holds good in the passing of the Russian thistle. These things come and go and come again, and the principle holds good with fungous diseases as well as with insects.

Papers were read by Mr. B. T. Galloway on "Progress in the Treatment of Plant Diseases in the United States," and by Prof. Webster on "Meteorological Influences on the Hessian Fly." These were retained for publication elsewhere. The meeting then adjourned to the Central Park to inspect Mr. Southwick's spraying outfit.

On reassembling in the afternoon an elaborate and valuable paper was presented by Messrs. E. D. Sanderson and C. L. Penny, of the Delaware Experiment Station, on "Hydrocyanic Acid Gas as an Insecticide on Low Growing Plants." The results of their experiments proved that this method of treatment is practicable, but, owing to its cost, only for plants of some considerable value and for relatively small areas. Under many circumstances it could be used to much better advantage than any other means of combating a pest, and often might be found effectual where no other method of extermination were possible.

Mr. Sanderson then presented a paper, "Notes from Delaware," in which he reported upon the most noticeable attacks of the year in that State, and dwelt particularly upon the destructive green-pea louse, which had already been under discussion. After giving an account of the various parasites which preyed upon the insect, he said:

"The enemies of the lice appear too late to prevent the bulk of the injury, and as the same was true last year, it seems impossible to place any dependence upon them. It seems evident, however, that the lice are attacked by a parasite while still in crimson clover (parasitized lice were also common on red clover), but are not parasitized until they have been on peas for some time. Is it not possible the sudden appearance of the lice last year may have been due to the severe winter, which killed off the parasites and other enemies which usually hold the lice in check on the clover and so reduce their numbers that but few of them spread to peas?"

"The very sudden appearance of this new species last year was a unique entomological surprise. Where it came from was a question. It would seem to me that the original food plant of the pest was clover and probably crimson clover. It is true that crimson clover is not grown in the North where the louse was found destructive last year, but it is entirely possible that it may have spread from sections in which crimson clover is grown to red clover in these localities, but have been held in check by its parasites, and remained unnoticed. Furthermore, the insect enemies of red clover have at various times received study without this species having been previously noted. On the other hand, there seems to be good evidence that the louse has been on crimson clover for several years. One of our best farmers, Mr. Frank Bancroft, of Camden, Del., tells me that he has seen what he judges to be the same louse on crimson clover for at least six or seven years. In 1890 crimson clover grown upon an experimental plot at the Delaware Station became so badly infested with a plant louse that it was feared it would be killed. Professor Beckwith's notes state (May 11, 1890) that these were exterminated by a fungous disease, and the clover was not seriously injured. Upon looking over the station collection I found specimens of *N. destructor* which unfortunately were without any label, but were among material which was unquestionably collected prior to 1896. Upon corresponding with Professor Beckwith he informed me that he distinctly remembered preserving specimens of the aphid in question. As his accession catalogue shows no such specimens to have been numbered, though by no means conclusive, the evidence is at least strongly circumstantial that *Nectarophora destructor* occurred in injurious numbers on crimson clover as early as 1890."

"As regards remedies, I have practically nothing new to offer. It evidently is important to plant crimson clover as far from peas as possible, and to turn it under as early as practicable."

APHELINUS FUSCIPENNIS AN IMPORTANT PARASITE UPON THE SAN JOSE SCALE IN EASTERN UNITED STATES.

BY W. G. JOHNSON, COLLEGE PARK, MD.

For the past eight years the writer has been paying particular attention to the parasites attacking scale insects. During this period many species have been bred, but not many specimens from any particular scale. The instance cited below is, perhaps, the most important from the economic standpoint yet discovered in these observations.

Since we assumed charge of the State work in Maryland we have collected the San Jose scale on various food plants, and inclosed infested twigs, about 4 inches in length, in glass cylinder tubes open at both ends. The ends were closed with cotton, and if any parasites existed upon the scales they were easily detected and mounted for study. Only upon rare occasions have we taken more than a half dozen specimens from a single tube. This experience has been repeated year after year until the fall of 1899.

Of the four species of true parasites known to feed upon the San Jose scale, three of them have been bred in Maryland. So far as I know *Anaphes gracilis* How., bred by Dr. L. O. Howard from scales from Charles County, Md., has not been reared from this scale from any other State. *Aspidiophagus citrinus* Craw. has been reared only in California from this pest. *Aphelinus mytilaspidis* Lo B. and *Aphelinus fuscipennis* How. have been reared from scales taken at the following places in this State: Riverside, Annapolis Junction, Araby, and Mitchellville. Last fall, however, I discovered a new locality for *A. fuscipennis* near Easton, Talbot County, in an infected orchard along the Miles River. The orchard contained a miscellaneous variety of fruits, and all the trees were quite seriously infested with the San Jose scale. Instructions had been given the owner to cut them down as soon as possible and burn them. A quantity of small branches incrustated with scale were brought to the laboratory and inclosed in breeding tubes. Much to my surprise these tubes were swarming with parasites a few days later. From one tube 1,114 specimens of *Aphelinus fuscipennis* were taken; while a second tube gave 432, a third 1,478, and a fourth more than 1,000, but owing to an accident the count in the case last mentioned was not exact. The writer was greatly elated over the discovery, and immediately sent out the following statement to the State press:

I am advising my correspondents not to burn twigs and branches cut from trees infected with the San Jose scale. If the tree is so seriously infested it can not be saved, it should be dug up by the roots, trimmed, and the brush and wood piled in the orchard, where they should be left until about the 1st of June or longer. If the trees are to be sprayed with either a 25 per cent solution of kerosene and water, whale-oil soap (2 pounds in a gallon of water), or crude petroleum, the pruning should be done first and the cut branches gathered up and piled where the spray cannot reach them.

This is done to preserve the little friends nature has supplied to help keep the scale in check. If the twigs and branches are burned or sprayed the parasites would be destroyed, as they feed upon the scale insects and are now wintering under the shell-like cover protecting them. These parasites are very small, being scarcely visible to the naked eye, yet they play an important part in the economy of nature. They are wasp-like in general appearance and quite active. It would be very difficult to estimate the actual number of parasites present upon a 5 or 6 year old peach or plum tree, but it is safe to say that they would run into the millions if the parasitism was at same rate as upon the twigs in the tubes.

If I had burned these twigs I should have destroyed all the parasites. On the other hand, if I had left them on the ground in the orchard the little friends would have escaped and concentrated their attacks upon other trees where the scale had been missed by the sprays. It is clear, then, that by using a little judgment in these matters we can assist nature in restoring the balance she desires. Do not sit down and fold your arms thinking nature is going to restore this equilibrium at once; you must do your part faithfully and well. Prune your orchard as soon as possible and save every twig that contains a scale; then spray with a 25 per cent. solution of kerosene and water, using any first-class spray pump, or with whale-oil soap (2 pounds to a gallon of water), before the buds open.

There is no possibility of the scale spreading until some time after the 1st of June. The young begin to appear in the vicinity of Washington, D.C., June 10 to 15 [in 1900 young were seen by the writer crawling June 3 near Washington], and the insect continues to breed until very cold weather. We have seen young, just born, on trees as late as December 19. When a twig is cut off between, say, December 20 and May 15, there is no possible danger of the scale spreading from it. It is not possible to transfer one of these insects from one twig to another after it is "set" and formed a scale over its back, and all of them die as soon as the sap is dried out of a cut twig or branch. Badly infested trees of no commercial value should be cut down as soon as possible, before the buds open, and the brush piled. Do not leave the stump standing, as it may prove a veritable breeding place during the summer. If you are so unfortunate as to have this scale, remember that eternal vigilance must be the order of the day, and you will find before you are through with it that it is no trifling matter.

The orchard in question was not destroyed by burning, as first suggested, but the trees were pruned and the cuttings saved. In May, 1900, the writer had a large quantity of the branches from this orchard carefully packed and sent to Mr. W. W. Cobey, Grayson, Charles County; to Capt. R. S. Emory, Chestertown, Kent County, and to Hon. Charles G. Biggs, Sharpsburg, Washington County. Instructions were sent to place the infested branches in grape baskets and hang them about the orchard where the scale was most abundant. In this manner we will establish *Aphelinus fuscipennis* in the various counties and under different conditions. We have every reason to believe that the experiment will prove successful.

In this case the study of parasitism has given us a valuable suggestion for the treatment of scale infested orchards, namely, never burn a twig or tree cut late in the fall, winter, or early spring. A positive remedy one day may be wrong the next day, just as we are able to unravel nature's secrets and interpret them for our own good.

Since the above was read the writer has tested a lot of twigs from the Charles County orchard and has bred numerous specimens of *A. fuscipennis*, thus proving that a parasite is thoroughly established there.

Mr. A. H. Kirkland read a paper on "the Brown-tail Moth in Massachusetts," in which he gave an account of the natural spread of this injurious insect throughout the State. The infested area in 1896 was only 29 square miles; in 1899 this had increased to 928 square miles.

The next paper was by Mr. C. P. Gillette, who gave a series of interesting notes on some of the most important insects of Colorado. Mr. Johnson followed with "Notes on insects of economic importance in Maryland during 1900," and Prof. Webster with an account of the "Insects of the year in Ohio." Foremost among these he placed the Hessian fly, regarding which he said: "In point of destruction the Hessian fly outranks every other insect, when considered in connection with the wheat crop of 1900. It is doubtful if there will be over 20 per cent of an average crop in Ohio; the remaining 80 per cent may be largely charged up to the ravages of this pest. As an average crop in Ohio amounts to, approximately, 40,000,000 bushels, the loss may be computed at 32,000,000 bushels, which at the ruling market price would mean a loss of \$22,400,000, at least three-fourths of which, or \$16,800,000 can be justly charged up to the ravages of the Hessian fly. More extended studies of this outbreak and some of the meteorological phenomena connected therewith are given in another paper. The unprecedented abundance of the pest this year may be attributed largely to the almost total lack of parasites, the retardation of the fall brood over the northern half of the State, and the extremely favorable weather during the autumn of 1899, which enabled all but the very latest deposited eggs to hatch and the larvæ develop to the "flaxseeds" and thereby defy the adverse influences of winter. In many localities the later sown wheat escaped fall attack and up to May 1, 1900, was uninjured, but the flies developing in the earlier sown fields seemed to have migrated *en masse* and settled down on those sown later, and the result is that in many cases the destruction is as complete in the one as in the other."

Mr. Woodworth gave a short account of the Entomological situation in the State of California, referring especially to Scale insects, the Colling moth, peach and grape insects. The last paper read was by Dr. Fletcher of Ottawa, who gave an account of the most noticeable insect attacks of the year in Canada, mentioning those affecting fruit trees, roots and vegetables, cereals, fodder-plants, and trees and shrubs.

Before the meeting closed, an interesting discussion took place on the matter of common names for insects, in which a number of the members took part. A committee was appointed to deal with the common names of such injurious insects as may be discovered in the future and to remove ungainly and inappropriate names.

The following officers were appointed for the ensuing year: President—C. P. Gillette, Fort Collins, Col.; First Vice-President—A. D. Hopkins, Morgantown, West Va.; Second Vice-President—E. P. Felt, Albany, N. Y.; Secretary-Treasurer—A. L. Quaintance, Experiment, Ga.

The next meeting will be held at Denver, Col. on the 22nd and 23rd of August, 1901.

REGULATIONS RE SAN JOSE SCALE.

Extract from The Canada Gazette of Saturday, January 12, 1901.

ORDER IN COUNCIL.

His Excellency, in virtue of the provisions of section 5, chapter 23, 61 Victoria, intituled "An Act to protect Canada from the Insect Pest known as the San Jose Scale," and of 63-64 Victoria, chap. 31, "An Act to amend the San Jose Scale Act," and by and with the advice of the Queen's Privy Council for Canada, is pleased to order that exemption from the operations of the above mentioned Act shall be and is hereby authorized of any trees, shrubs, plants, vines, grafts, cuttings or buds, commonly called Nursery Stock from any country or state to which "The San Jose Scale Act" applies; and that all importations thereof shall be and are hereby permitted to be entered at the Customs Ports only of St. John, N.B., St. John's, Que., Niagara Falls and Windsor, Ont., and Winnipeg, Manitoba, between the following dates in each year: 15th March to 15th May in the spring, and 7th October to 7th December, in the autumn; and at Vancouver, British Columbia, during the winter months only from 15th October to 15th March, at which ports they will be thoroughly fumigated with hydrocyanic acid gas by a competent Government official in accordance with the most approved methods.

All shipments made in accordance with the above will be entirely at the risk of the shippers or consignees, the Government assuming no risk whatever.

Packages must be addressed so as to enter Canada at one of the above named ports of entry, and the route by which they will be shipped must be clearly stated upon each package.

As it is well known that well matured and thoroughly dormant nursery stock may be safely treated, but that there is danger of serious injury to the trees if fumigated in the autumn before the buds are thoroughly dormant, or in the spring after the buds have begun to unfold, all stock which when received is immature or too far advanced for safe treatment will be refused entry and held at the risk of the shipper.

His Excellency, in virtue of the provisions of section 7 of the Act first above mentioned, is pleased to direct that the authority herein granted be published in the *Canada Gazette*.

JOHN J. MCGEE,

OTTAWA.

Clerk of the Privy Council.

OBITUARY.

Mr. JOSEPH EVELEIGH TREFFRY died at Quebec, of spinal meningitis on the 27th day of April last—his second wife had died but a few months before. Mr. Treffry belonged to a Cornish family. He came to Canada about thirty years ago, and at first lived in Montreal. After a while he moved to Quebec, and for ten years was reporter and proof-reader on the staff of the *Morning Chronicle*. He left newspaper employment to accept the Government position of English translator in which he continued till his death. He had been a member of the Quebec Branch of the Entomological Society of Ontario from its formation; and his ready pen and ability as a journalist had often been exercised in its favour. Before his bereavement his wit and good humour had added greatly to the interest of the meetings of the branch. He was buried in Mount Hermon Cemetery.

T. W. F.

THE NORTH-WEST (CANADA) ENTOMOLOGICAL SOCIETY.

The second Annual Meeting of the North-West (Canada) Entomological Society was held at Lacombe, Alberta, on 16th January, 1901. It was a meeting essentially in the interests of farmers. At the request of the President, the chair was taken by Mr. F. H. Wolley-Dod, of Calgary, who was supported by the vice-President, Rev. M. White, and several well-known farmers of the district. A number of letters in support of the objects of the Society were read, including letters from Mr. C. W. Peterson, Deputy Commissioner of Agriculture, N.W.T.; Prof. C. C. James, Deputy Minister of Agriculture, Ontario; Dr. James Fletcher, Dominion Entomologist, and the Right Reverend the Bishop of Calgary and Saskatchewan.

The President of the Society, Percy B. Gregson, on being called upon (after the opening remarks by the Chairman) explained that the object of the Society was to instruct and interest the farmers of the North-West regarding the insects that affect them,—to bring home to them individually the principles which underlie the treatment of insect and weed pests, so that they can deal with them in time, without waiting, as so many do, till their crops are destroyed before applying for advice. Mr. Gregson stated that farmers were beginning to appreciate the value of the study of insects, and this was evidenced by the fact that a number of Agricultural Societies had during 1900 become active supporting members of the North-West Entomological Society. Mr. Gregson impressed on farmers the importance of careful observance of the habits of the insects that came under their notice, such as their time of appearance, their method of feeding, the nature of their food, etc. Some insects, such as beetles and caterpillars, feed by nibbling their food, and poison should therefore be placed on their food, so that the insects when consuming the leaf will also consume the poison with it. Other insects such as lice, pierce through the outside of the leaf with their trunk-like beaks, and poison, therefore will not reach them. As however, insects breathe through little openings in their sides they can be suffocated by anything which clogs up their breathing valves, such as coal oil emulsion, or the fumes of tobacco.

The list of injurious insects in the North-West is already a long one, and as insects always follow cultivation, we must, as the country gets cultivated, expect arrivals of fresh insects. There are very many ways by which insects are always liable to be imported into a new country. They may come in clothes, lumber, domestic animals, packing substances (such as hay, straw or grass). It was probably in packing substances that all the grass stem maggots, common to Europe and America, have reached us, including the Hessian fly, the wheat stem midge, and wheat stem saw-fly.

In applying remedies there is a reason for each different remedy recommended, and in the list of insects presently given the reason for each remedy can readily be seen.

THE PRINCIPAL INJURIOUS INSECTS OF THE NORTH WEST FOR 1900.

The Red Turnip-beetle (*Entomoscelis adonidis*). In many places from south of Calgary to north of Edmonton, and in Saskatchewan and several districts in Assiniboia this beetle has been more or less abundant—in some instances devastating entire fields. Around Beulah, in Manitoba, it has also been somewhat abundant, but chiefly confined to mustards. Remedy: Spray the plants with Paris Green solution (1 lb. to 160 gallons of water) and stir in also 1 lb. of quick-lime, or if in small quantity, $\frac{1}{2}$ oz. of Paris Green, $\frac{1}{2}$ cz. of quicklime, and a pail full of water. In mixing Paris Green Dr. Fletcher recommends that it should first be made into a paste with a small quantity of warm water, and the paste afterwards mixed with the larger amount of water required. If it does not adhere readily to the leaf, a little soap added to the water will overcome the difficulty.

The Turnip flea Beetle (*Phyllotreta vittata*) has been very general throughout the North-west Territories, but the damage done was not great, owing to a counter-attraction in the shape of mustards. Remedy: Dust the young turnips with dry Paris Green and land plaster, or dry Paris Green and sifted ashes when the dew is on the young turnips. This little beetle hatches in May—about the third week—and by deferring sowing the turnips until June the beetle will have hatched and disappeared to native cruciferous plants before the young turnips are up.

The Diamond Back Moth (*Plutella cruciferarum*) in June and early July was extremely abundant throughout the Territories and in many parts of Manitoba, practically the whole of the cultivated area of Alberta, Assiniboia and Saskatchewan was visited by this pest, and many fields of cabbages, cauliflowers and turnips were completely destroyed. The larvæ of this moth also attacked lettuces, radishes, rape, etc. A field of turnips badly infested with this pest presents a weird and ghastly appearance. The riddled leaves are bleached and white like skeletons. Parasites have destroyed immense numbers of the larvæ. Remedy, as to turnips, young cabbages, etc., except lettuces: Paris Green solution as recommended for the Red Turnip-beetle. The chief difficulty is in getting at the underside of the leaf, as the larvæ principally attack from underneath. In the case of lettuces, hellebore should be used. Scatter on the eaves—as much underneath as possible—when the dew is on, a mixture of 1 lb. of hellebore to 2 lbs. of sifted ashes.

The Colorado Beetle (or Potato-bug) has again made its appearance in Central Alberta, though not in large numbers. On 28th June both larvæ and mature insects were seen in several potato fields, but no great damage done. As this is the second year of appearance of this insect in Alberta it is possible these are an advance guard, and it is well to look out for them. Remedy, the same as for the Red Turnip-beetle. Do not kill the lady-birds. This bright scarlet little beetle and its larvæ greedily devour the young larvæ of the Colorado beetle.

The Three-lined potato-beetle has been more troublesome than the Colorado beetle. In some localities in the south of Central Alberta it has seriously damaged potato crops, but its presence elsewhere has not been reported. This beetle was the chief insect pest of potatoes in Ontario until the arrival of the Colorado beetle, which it seems to have heralded. Remedy, the same as for the Red Turnip-beetle.

The Rocky Mountain Locust has been very bad in parts of Manitoba, north of Douglas, and around Aweme. This pest is dealt with in the May, June and July numbers of the leading agricultural journals, issued from Winnipeg, so fully and clearly that its characteristics and remedies need not be repeated at length. In the Nor'-West Farmer, for instance, of 21st May, 1900, is a very good account of them. The insect lays its eggs in the soil among the stubble in the early fall (August and September) and they hatch in the following spring. If, therefore, the soil be deeply fall plowed the eggs will be buried so deep that the young when they hatch cannot get to the surface.

Cutworms,—(in Alberta and Assiniboia principally the garden ones such as *Agrotis clandestina*, *Plusia brassicæ*, and *Carneades ochrogaster*) have caused the usual amount of loss and replanting in several districts among cabbage and cauliflower growers. It is difficult to understand why there need be any loss from this pest when the remedy is so easy. Remedy: Take say 50 lbs. of bran and very slightly moisten it with water, and sweeten with a little sugar. Then mix well with it enough Paris Green to just color the bran (e.g. about a lb. of Paris green). The cutworms will eat this bran in preference to the cabbages. The common cutworm is not a climber, so wrapping a piece of smooth paper about 3 inches in breadth around the stem of the young cabbage when planting out is a good preventive remedy. The paper should be $\frac{1}{2}$ an inch below the surface of the soil and 2½ inches above. Keep the garden clear of weeds and rubbish, old cabbages or cabbage stalks in the fall, so that the cutworm moth will have no attraction for laying its eggs. A more serious trouble, however, has been caused by another kind of cutworm in Manitoba. This is the glassy cutworm (*Hadena devastatrix*), and it, in the spring, committed very serious injury to wheat crops north of Stonewall. This pest was present in some fields in thousands, and marched in a phalanx devouring as they travelled. The remedy for the glassy cutworm is not easy. The grub burrows into the earth in the day-time, and comes to the surface to feed at night. It eats the whole plant, beginning just below the surface. Thoroughly spraying the grain along the front of their attack for a space of ten feet with a solution of Paris Green has been found successful. If however the crop has been ruined, turn chickens or turkeys into the field for a day or two, and then sowing oats for green feed might be tried.

Wireworms. These are the larvæ of the "click beetles." This is a pest very difficult to get at. There are several species of wireworm. They pass the winter in cells in the soil, so that for some species a plowing in August, and for others a plowing late in

the fall, will disturb these cells and kill the inmates by exposure. Seeding down only encourages the wireworm, but barley and rye seem distasteful to this pest, and fair crops of these can be grown even if the field be badly infested with it; and possibly the field itself be ultimately cleared of the pest.

Among pests of foliage has been the pallid aspen beetle. The loathsome larvæ of this beetle were very destructive to the early leaves of aspen poplars throughout Alberta and the Territories, and considerably marred their beauty. Remedy: Poison their food by spraying with Paris Green solution.

The striped cottonwood beetle was also very abundant on willows. The fetid larvæ emit, when disturbed, a milk-like fluid from tubercles along their back, and trail a sticky fluid wherever they crawl upon the leaf. This is a very troublesome pest in the East, in districts where osiers are cultivated. The larvæ as well as the beetle cause the osier canes to branch by injuring the tips. Should osiers be cultivated in the Northwest this pest will be on hand. Remedy: Paris green or green arsenite solution sprayed on the food.

Lice on poplars and plants have been common in many parts of Alberta. Remedy: Suffocation by coal oil emulsion, or fumes of tobacco. The Western Blister Beetle was reported like "swarms of bees" on beans at Lethbridge in Southern Alberta about 25th June. Other blister beetles were abundant on vetches in Central and Northern Alberta.

Fleas. Towards the end of summer this pest became an intolerable nuisance throughout the Northwest. Hay mattresses swarmed with them. A slight odor of carbolic acid will prevent them from coming into a room so scented; but if introduced with hay or otherwise, then burning pyrethrum powder is a good remedy for driving them out.

Warbles in cattle appear to be on the increase. Cattle farmers are very well acquainted with this fly, but it is a trouble that is too apt to be treated as of not a very serious nature, and as not preventable. This, however, is a great mistake. In the first place the bot maggot, or warble, so damages the hides that grubby hides sell for one-third less than sound ones. But the beef itself is rendered so inferior that buyers of the highest class of meat, who supply hotels, &c., will not on any account buy carcasses showing traces of warble attack. Such beef has therefore to be sold at a lessened price below that obtainable for good beef, the reduction sometimes amounting to \$5 per carcass. In view of the large and increasing exports of beef (cold stored) to England, it becomes important to see that the reputation of the Northwest is sustained by keeping stock free from this pest. In dairies, too, the loss sustained through the attacks of warbles is just as serious. There is the loss in quantity of flow of milk as well as deterioration in quality, resulting from the annoyance of the animals by the flies when depositing their eggs, and later by the grubs. The shrinkage in the milk is estimated at 10 per cent. and the deterioration in quality at the same rate, making a total of 20 per cent. By the time the warbles are discovered in the spring the mischief is done. Certain localities are more particularly infested than others, and a dry season seems more encouraging to the warble fly than a wet season, and where there is danger of the warble the animals should be protected during the summer months by spraying them occasionally with strong smelling oils, such as fish oil, train oil, kerosene emulsion, &c.

To make kerosene or coal oil emulsion add 1 gal. of kerosene hot soap suds made of $\frac{1}{2}$ gal. of water (rain water preferred) and $\frac{1}{2}$ lb. soap. Then churn all thoroughly together till it will adhere to the surface of glass without oiliness. When required for use, dilute the emulsion by adding from 9 to 15 times its measure of warm water.

After the close of the discussion consequent on the President's address, the officers of the Society for the year 1901 were elected. The officers for 1900 were re-elected in the capacities respectively held by them with the exception of A. D. Gregson, who retired from the curatorship, the same being accepted by Percy B. Gregson, the collections having been safely removed to his house.

Mr. F. H. Wolley-Dod most generously presented to the Society a large number of Lepidoptera, the bulk of which were new to the collection.

Mr. O. C. Poling, of Quincy, also presented to the Society several exceedingly rare specimens including *Neophasia Terlootii* and *Erebia Magdalena*. Some of these specimens are represented in but one or two other collections in the world.

After a vote of thanks to the Chairman, the proceedings terminated.

REPORT OF THE COUNCIL.

On behalf of the Council of the North West (Canada) Entomological Society, the President begs respectfully to submit the following report :

Several fresh works have been added to the library of the Society during 1900, among them being a complete set of "Insect Life," (partly the gift of Dr. L. O. Howard and partly by purchase). The impossibility in this distant country of access to an outside library of any kind has been and is an obstacle which the Society hopes gradually to surmount by accumulating serviceable works of its own.

It is encouraging to note that the farmers are taking a marked and growing interest in economic entomology,—the President having during the past year given by request addresses or papers on twelve occasions and at various places in Alberta and Saskatchewan. Various agricultural societies have become active supporting members of the North-West Entomological Society.

A field class of young folk has been started in Lacombe, and operations (all being well) will be commenced in the ensuing spring.

A most welcome assistance has been received from the Territorial Government in the form of an annual grant of \$25 towards furthering the objects of the society.

Acting on the advice of the original supporters of the Society, it was decided to defer attempting the issue of a magazine for a year, and in the meantime the president has, without cost to the society, circulated a large number of agricultural papers among farmers whenever such papers published matters of interest in economic entomology.

PERCY B. GREGSON,

President

1st January, 1901.

AUDITORS' REPORT.

Receipts and expenditure of the North-west (Canada) Entomological Society :

Receipts.

Members' Fees.....	\$26 00
Territorial Government Grant...	25 00
Deficit (met by President).....	38 50

\$89 50

Expenditure.

Library :	\$26 00
Stationery.....	7 00
Meetings (Farmers' etc.).....	23 00
Printing account.....	6 50
Cork, pins, etc.....	5 00
Store books, glass, etc. and other apparatus.....	8 00
Expense account (postage, etc.)...	7 00
Subscriptions to periodicals.....	7 00

\$89 50

I hereby certify that I have examined the books and vouchers of the Treasurer of the North-West (Canada) Entomological Society and find them correct, and the above is a true statement of the accounts of the Society.

J. L. TIPPING,

Auditor.

Waghorn, 1st. January, 1901.



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THIRTY-SECOND ANNUAL REPORT

OF THE

ENTOMOLOGICAL SOCIETY

OF

ONTARIO

1901.

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.)

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO.



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WARWICK BROS & RUTTER, PRINTERS.
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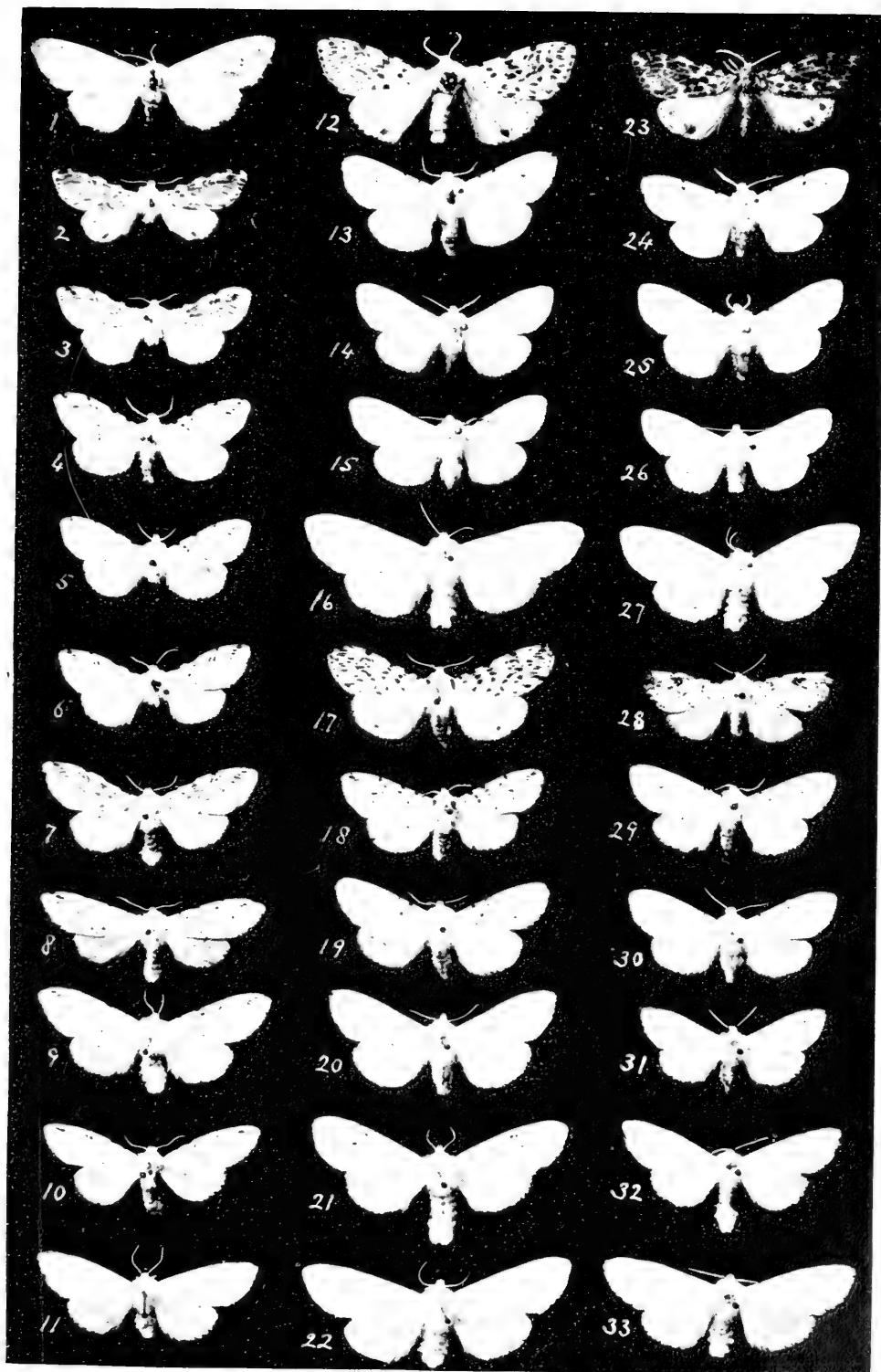
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MISS ELEANOR A. ORMEROD, LL.D., F.R. MET. SOC., F.E.S.
Hon. Member Ent. Soc., Ontario, etc., etc.





HYPHANTRIA CUNEA, Drury.



THIRTY-SECOND ANNUAL REPORT
OF THE
ENTOMOLOGICAL SOCIETY OF ONTARIO,
1901.

To the Honorable John Dryden, Minister of Agriculture :

SIR,—I have the honor to present herewith the Thirty-Second Annual Report of the Entomological Society of Ontario.

The thirty-eighth annual meeting of the Society was held in London on the 13th and 14th of November, 1901, at which the members had the gratification of your presence and participation in the proceedings. During the sessions the officers for the ensuing year were elected ; reports were presented by the various branches, sections and officers of the Society, including the audited financial statement of the Treasurer ; and papers and addresses were given on a variety of entomological subjects, many of which are of great practical value.

The Society's monthly magazine, the *Canadian Entomologist*, has been regularly issued during the year and has now completed its thirty-third volume. Its circulation in all parts of the world continues to increase and its high scientific character has been ably maintained by a large number of contributors.

I have the honor to be, Sir,

Your obedient Servant,

CHARLES J. S. BETHUNE,
Editor.

LONDON, ONTARIO.

OFFICERS FOR 1901-1902.

President Rev. T. W. Fyles, D.C.L., F.L.S., South Quebec.

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Division No. 5—J. A. Balkwill, London.

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Librarian and Curator—J. Alston Moffat, London.

Auditors—J. A. Balkwill and W. H. Hamilton, London.

Editor of the Canadian Entomologist—Rev. Dr. Bethune, London.

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Delegates to the Western Fair—J. A. Balkwill, and W. E. Saunders, London.

Committee on Field Days—The Chairmen of the Sections and Dr. Woolverton, Messrs. Balkwill, Bowman, Law, Moffat, Rennie and Saunders, London.

Library and Rooms Committee—Messrs. Balkwill, Bethune, Bowman, Dearness, Moffat and Saunders, London.

THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

ANNUAL MEETING.

The thirty-eighth annual meeting of the Entomological Society of Ontario was held in London on Wednesday and Thursday, the 13th and 14th of November, 1901. The chair was occupied by the Rev. Dr. Fyles, of South Quebec, President. Among the members present were Dr. James Fletcher and Mr. Arthur Gibson, Central Experimental Farm, Ottawa; Mr. Henry H. Lyman, Montreal; Mr. John D. Evans, Trenton; Prof. Lochhead, Ontario Agricultural College, Guelph; Mr. Geo. E. Fisher, Inspector of Scale Insects, Freeman, Ont.; Mr. Charles H. Young, Hurdman's Bridge, Ont.; Prof. F. M. Webster, State Entomologist, Wooster, Ohio; Revs. Canon Dann and Dr. Bethune; Drs. W. J. and H. A. Stevenson, Dr. Woolverton, Messrs. J. A. Balkwill, J. H. Bowman, J. Dearness, John Law, J. Alston Moffat, W. E. Saunders, R. W. Rennie, E. A. Brown, Demster, Thompson, Lochhead, and many other residents of London. The Society was also favored with the presence of the Hon. J. Dryden, Minister of Agriculture for Ontario, and Mr. G. C. Creelman Superintendent of the Farmers' Institutes of Ontario.

Letters expressing regret at their inability to attend were received from Directors, W. H. Harrington, Ottawa; D. G. Cox, Toronto; and James Johnston, Bartonville; and from Messrs. E. M. Walker, Toronto; A. F. Winn and Dwight Brainerd, Montreal.

The morning of Wednesday, November 13th, was taken up with a meeting of the Council for the transaction of the business of the Society and the preparation of their annual report. In the afternoon the Society met at 2.30 o'clock and at once proceeded to discuss the progress, present aspect and future outlook of the San José scale in Ontario. The President, Dr. Fyles, expressed his gratification at the presence of so many eminent men at their meeting and felt assured that the conference they were entering upon would be of great value both to themselves and to all interested in fruit culture in this Province.

SAN JOSÉ SCALE DISCUSSION.

At the request of the President, MR. GEORGE E. FISHER, of Freeman, Ont., the Provincial Inspector of Scale insects, opened the discussion. The following is a condensed summary of his address: I wish to state at the outset and to emphasize very strongly the fact that very few fresh localities have been found this year infested by the San José scale. This is very encouraging and leads us to feel that the prospects of stamping it out are not altogether hopeless. People are now realizing better than ever before how dangerous an enemy it is; but it is remarkable how many mistakes were made in identifying the scale, the oyster-shell bark-louse, the scurfy bark-louse, and others, being mistaken for it. In the localities where the scale is present, its increase and destructiveness have been greater than ever before; it does not confine itself to one place, but reaches out into new localities beyond its former limits. As an illustration of the very great increase of the scale, I may give one instance. There is an orchard of 1,600 peach trees which was inspected in August, 1899, by seven experienced men; they spent six days in their examination and only found the scale on 87 trees, showing that the infestation was but slight. In August of the following year, 1900, I could find the scale on every tree I looked at, but still a good crop of fruit was produced. This year (1901) that orchard is practically dead; it will never bear another crop of fruit; the scale is to be seen

everywhere throughout it. There are quite a number of just such orchards as that, and they constitute an object lesson which is constantly before the people—they cannot close their eyes to a dead orchard. In another orchard I have eaten peaches this last summer gathered from trees which have since become encrusted with the scale and will soon die from the attack.

There is a third orchard that I know of, a large orchard, from which about 25,000 baskets of peaches were picked this year. About the 23rd of September I visited it and found the scale on every tree along a row reaching across the orchard; unless this orchard is put under proper treatment at once it has only one more year to live. The alarming rapidity with which the scale spreads when once it has found lodgment causes it to be so destructive and so difficult to control. Thus far I have spoken of peach trees, but the scale attacks other kinds also. We have instances of plum trees, pear trees and even apple trees which are dead from the attack of the scale. Apple trees I have found more resistant than peach and was inclined at first to think that they would not be much affected, but the evidence to the contrary is too conclusive when we find apple trees which have been killed outright by the scale. The lower limbs are usually attacked first and then it spreads upwards till the whole tree is infested. I visited an apple orchard of 350 trees in 1899 which was then bearing well; the scale was found but the infestation was slight. Last year it bore a good crop of fruit, but it is doomed and will never bear again—most of the trees will be dead next year.

Now, as to remedies. There are four which serve good purposes. These are whale-oil soap; crude petroleum, and a combination of these two; lime, salt and sulphur (the favorite wash in California); and fumigation with hydro-cyanic acid gas. Whale-oil soap should be made strong, 2½ lbs. of good soap to a gallon of hot water, and should be applied freely to saturate every part of the tree. Many people sprayed only one side of their trees, waiting for the wind to change to do the other, and ending by leaving it undone. Others sprayed the trunk where there was no scale and left the boughs alone, though they were full of it.

Crude petroleum should be applied with great care; it seems to be perfectly safe when used for apple trees, which stand it better than any others, but is very dangerous for peach trees. I have never seen an apple tree which has been injured by it in this country; in New Jersey some trees have been killed, but it was not the crude petroleum that was used. I have found better results from it than from whale-oil soap, and it has also the advantage of being cheaper. The combination of soap and oil is a remedy which requires to be worked out. I am doubtful about it at present but I believe that it will yet prove an excellent remedy when the right proportions have been ascertained by experiment. Fifteen per cent, crude petroleum with water kills the scale but endangers the tree; 25 per cent. with 1 lb. whale-oil soap and a gallon of water is effective and not injurious to the same extent.

Lime, salt and sulphur as a remedy I like very much, but it is difficult to prepare; it requires some convenient mode of cooking, which is the important part, and the apparatus necessary for this is not always to be had. When cooked half a day, using lime that had been slacked in boiling water, it worked well, and so whitened every part of the tree that it reached that its application could be clearly seen; no portion of the tree should be left untouched. The reason this wash is so much more effective in California is because there are no heavy rains there to wash it off. Still, it can be used to good purpose here. Last May was very wet, and it began to rain while we were treating some trees and continued for a long time, yet the wash was successful, and we expect still better results in dry weather.

Fumigation with hydro-cyanic acid gas we tried at different points and at different times during the season, beginning in April and continuing till September. Over 300 trees were treated and a single live scale cannot be found on one of them. In the orchards trees affected by scale were marked and fumigated, the rest were sprayed. It is a troublesome and expensive remedy, but it will pay the fruit-grower to use it, when he would otherwise lose his trees.

If crude petroleum is applied to the trees as late as possible before the buds open in spring it covers the parts treated with a film of paraffine which remains on the trees during most of the summer and effectually keeps off the scale.

HON. J. DRYDEN : Which treatment would you put first? Can you depend on any of them to destroy the scale?

MR. FISHER : There is no doubt that crude petroleum is the best for destroying the scale, but it cannot be used with safety on some trees. I should not think of using it on peach trees which were in any way weakened; it should only be applied to the most healthy and vigorous trees. It can, however, be safely used on apple, pear and most plum trees, but not on Japanese or egg plums. Where it can be trusted its effect on the trees is very good indeed. One great difficulty is that the ordinary nozzles are too coarse. I should much prefer a finer one than those made. (Here he exhibited three nozzles—one made by the Spramotor Co., of London, Ont., the other two finer ones that were made by a watchmaker according to his instructions).

Whale-oil soap is a very useful remedy for peach trees which would not stand the petroleum treatment. It should be thoroughly applied until the trees are completely saturated and the scale is entirely soaked. The difficulty regarding it is that it is too expensive. It costs 12 cents for soap to spray each peach tree, while the crude petroleum would only cost 2 cents. A combination of the soap and the oil would cost from 4 to 5 cents. The lime, salt and sulphur wash, taking the lime at 12 cents, the salt at 8 and the sulphur at 30, would cost 1 cent per gallon or 2 cents per tree, using two gallons to a tree. Fumigation costs from 15 to 17 cents for the chemicals required for a full grown peach tree.

The peach tree grower should allow the branches to grow close to the ground without a long trunk, the lowest branches being only a foot above the surface. This produces a tree which is better than a tall one for picking, for spraying, for fumigation and for obtaining shelter; it also has no long trunk for harbouring borers.

He found that in using crude petroleum with 20 p.c. water more trees were killed by the Ontario oil than by the American, the latter being much heavier. The specific gravity of the Ontario oil was $39\frac{1}{2}$ and that of the American $44\frac{1}{2}$. The former was procured from Wallace-town, Ont., through David Barr of Dutton, and the latter from Titusville, Penn. Undiluted oil sprayed with an ordinary nozzle would kill all trees.

The speaker then gave an account of some of his experiences during the past season. One instance was an orchard at St. Catharines in which he treated a block of trees; these are all healthy now, while east of them, only twenty yards distant, there are three or four rows of peach trees which were partially treated by the owner and have since all died.

Near Niagara 370 trees, plum and pear, were inspected on September 20th and found so much infested with scale that they could not stand them during the remainder of the season and the fruit was no good. He made a light application with 25 gals. crude petroleum, half a pint to a tree diluted with 25 p.c. of water; it did not hurt the trees and killed most of the scales. These trees will be treated again in the spring. The addition of water to the oil increases the volume and enables the oil to be more readily sprayed; it soon evaporates and leaves only the oil on the trees.

I cannot—he said—recommend any remedy that will fit every case, nor any nozzle. These may be one-fourteenth inch, one-twentieth, one twenty-fifth, one-thirty-third, one-fiftieth and one-sixty-sixth. One-fortieth is a good size; it makes a very fine spray, and the operator can regulate without difficulty the amount applied, as it works more slowly than a coarse one.

MR. JOHN LAW : Does this nozzle ever get clogged?

MR. FISHER : No; the pressure keeps it clear. A long extension pipe should not be used; the shorter it is the better for satisfactory work.

After replying to several questions regarding spraying apparatus, materials and methods of application, Mr. Fisher said: I find now that there is an entire change of feeling amongst the

people. Two years ago they had not seen trees killed by the scale ; now such cases are frequent and they furnish an object lesson which cannot be misunderstood. Fruit growers who find the scale on their trees, realize that something must be done and done without delay. Experience now shows the wisdom of the methods adopted by the Department of Agriculture, though so much objection was made at first. The only sure and perfectly effective remedy is *burning up* all infested trees. Had we begun our investigations a few years sooner we should have succeeded in getting rid of the scale altogether in this Province, but when once introduced into the country it is no easy matter to trace its whereabouts.

In the fall of 1898 we started out with a long list of suspected nursery stock and on investigation found trees infested with the scale in 100 places. These trees were taken out and burned as fast as they were found, and now the localities where they grew are entirely free from the scale. This, together with the splendid work that has been done in the nurseries, has saved the country from a deluge of scale.

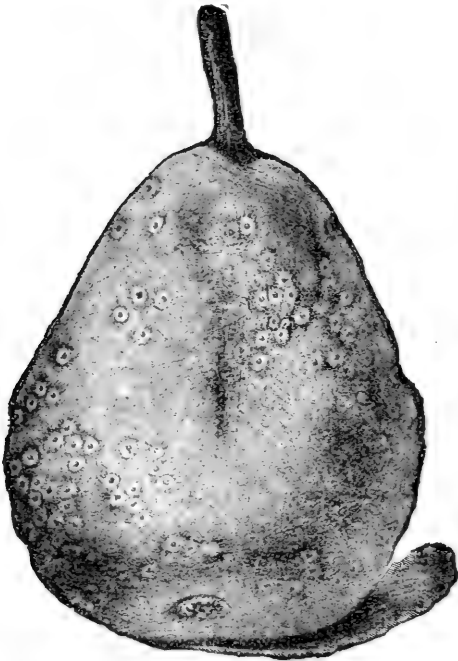


Fig. 1. Pear infested with the San José scale.



Fig. 2. Portion of a branch infested with the San José scale.

In the infested districts the increase and spread of the scale is very great indeed ; but where we have treated the trees, even for one year, the insect is under control. The situation is very much improved and I believe, from the results of our work, that by careful treatment we can control the scale and preserve the fruitfulness of our trees. Where good work has been done for one or two years, the results are such as to justify us in coming to this belief. If the treatment were universal, there would be no spread of the scale.

In answer to questions Mr. Fisher said that many who formerly objected are now treating their trees as they have learnt the necessity for it and seen the good results. The best time for treatment is the month of April. No body of men sent out from the Department of Agriculture could cover the affected territory within that month, it is therefore absolutely necessary that the work should be done by the owners of the trees, who are, of course, the parties most interested in the matter.

THE SAN JOSÉ SCALE IN OHIO AND IN ONTARIO.

Dr. FLETCHER, of Ottawa, considered this meeting one of more than usual importance. No subject which had ever engaged the attention of entomologists could compare with that of the injuries done by the San José scale, and the finding of a practical remedy. The Federal, Provincial and State Governments in Canada and the United States had done everything possible to direct the attention of fruit growers and gardeners to the danger of neglecting this terrible pest and allowing it to spread through the country. Much good work had been done, but further experiments were necessary before a quite satisfactory answer could be given to the vital question: "Is there any definite, practical remedy for the San José scale?" He congratulated the Society that the Hon. John Dryden had considered the meeting of importance enough for him to leave his other work in a very busy department to come to London to encourage the Society and to hear the latest views on the subject. The leading entomologists of the world, in America, in Australia and in other countries were now directing their efforts to this very question of getting an effective, easy and cheap remedy for the San José scale.

The speaker had been fortunate enough recently to have an opportunity of going right through the infested areas in Ohio and Ontario and examining the experiments which had been tried to control it. In the first place, it should be stated that the San José scale only exists at the present time, as far as Canada is concerned, in one corner of the Province of Ontario, extending along the shores of Lakes Ontario and Erie in the Niagara Peninsula. The important experiments which had been carried on during the past season by Professor F. M. Webster in Ohio and by Mr. Geo. E. Fisher in Ontario were most instructive, and the results were really very similar in nature. In passing through these infested areas it was noticeable on both sides of the line that it was the same insect with the same habits in both places, the climate and the soil conditions were the same, and the fruit trees and fruit growers were identically of the same nature. The San José scale is without any doubt a terribly destructive insect, but it is so inconspicuous and difficult to detect when in small numbers, that there has been difficulty in getting farmers to appreciate how great the danger is. The great outcry nowadays is for definite information. The speaker claimed that the present occasion demanded, and he intended to make, very definite statements, founded on his recent investigations in Ohio and Ontario, and he knew these would be backed up and confirmed by Prof. Webster and Mr. Fisher, both of whom were present.

In the first place, with regard to the possibility of the San José scale killing trees in Canada. Many had hoped that Canada was too far north for the scale to increase rapidly enough to kill trees outright. In reply to this he had to say that he had recently seen plums and peaches which had been quite killed in two years from the time they were found to be first infested, and many other trees which, although not actually killed, were so seriously injured that they were practically useless. Even apple trees, which were thought to be much better able to withstand the attacks of the scale, were in many places, and particularly with some varieties, so much damaged that they were much disfigured by having a large number of their lower branches killed. It must, therefore, be concluded that the San José scale not only had killed trees outright in Canada in a very few years, but that its powers to increase and do harm are just as bad here as they are in other localities where it has gained a foothold.

The Ohio experiments, carefully planned and worked out by Prof. Webster and his expert assistants, showed plainly the benefit of special training in this kind of work. It was most noticeable that where orchards had been carefully sprayed excellent results had followed. This was particularly the case where the work had been done by the entomologists; however, where good practical fruit growers had carried out the instructions carefully the trees had been protected and paying crops had been secured. The advantage of experience was very

conspicuous in some of these orchards, the owners acknowledging that, although they thought they had done good work the first year, they were now able themselves to see that the second year's work was far better done than the first and they would be in a better position again next year to do the work better and more thoroughly. Some fruit growers had sprayed their trees in a perfunctory manner and had done little good. Spraying, to be effective, must be done with the greatest care as to every detail and with the greatest thoroughness, so that every part of the tree may be treated with the application. There are of course difficulties in spraying as well as in every other operation which is worth doing; not only must the apparatus be of the very best, but the materials must be of the proper kind and mixed in exact proportions. The applications must be made at special seasons of the year, and it will pay fruitgrowers to see to this important operation themselves.

With regard to a definite remedy, Dr. Fletcher claimed that a definite remedy for the San José scale had already been given to the country. There was nothing particularly new as to methods of work nor which could not be found by everyone in the report of the Inspector of San José scale, which was available for all who would ask for it from Mr. Dryden's department. This was published last spring, and was a most valuable report. It was very regrettable that so few people who owned orchards seemed to be aware of its contents, or there would not be so many enquiries for a definite remedy when the good results given in that report showed that paying crops could be grown in orchards infested with the San José scale if they would regularly apply the remedies which were recommended by Mr. Fisher. In passing recently through infested areas, the fact was borne in upon him that if trees were treated every year, either with the whale-oil soap solution or the crude petroleum application, or, where the size of the trees would allow of it, if they were fumigated every year, paying crops could be grown, and he believed that the trees would year by year become freer from this pernicious enemy. Where trees had been neglected for only a single year, they had become coated with the scale so as to be almost or quite as bad as they were before they were treated.

The three remedies which the speaker claimed were definite practical remedies, were as follows:

(1) Whale-oil soap. This is a potash fish oil soap which can be purchased of good quality of some Canadian firms, of W.H.Owen of Catawba Island, Ohio, and of Good & Co. of Philadelphia, or it can be made with care and with a great deal of trouble by a private individual. To be effective, this mixture must be made of the strength of two and one-half pounds of whale-oil soap to the imperial gallon of water. To dissolve thoroughly, it must be mixed with hot water and is best applied just before the buds burst in the spring. Although, as a general statement, orchards treated with this soap mixture were not so free of the scale as those which had been treated with crude petroleum, still at the same time it was a fact that the two cleanest of those orchards lately examined which at one time had been infested and had been subsequently to a certain measure cleaned up, had been brought to their present good condition by the use of whale-oil soap. There were no very bad trees in these two orchards and scales could only be found with difficulty.

For peach trees this remedy is decidedly the safest to use. Its only drawback is the cost of the material. In large quantities it can be purchased, or made, for about $3\frac{1}{2}$ cents a pound, and of the strength above advised it would require one and a half gallons of mixture containing $3\frac{1}{2}$ pounds of soap to an average size full-grown peach tree, making about 12 cents for material to each tree. The great advantage is that there is no danger of injuring the trees, and, further than this, the amount of potash in the soap makes it a decidedly beneficial application as a fertilizer.

(2) Crude petroleum. This mineral oil is decidedly more fatal in its effects both upon the scale insects and upon the trees. There are some matters connected with the effect of crude oil upon various fruit trees which still require elucidation, but both Prof. Webster and Mr. Fisher are

working hard on this subject, and, from the progress which has already been made, it is probable that before long their careful experiments (which it is of the utmost importance should be continued) will give results by which the danger of injuring the trees by inexperienced workers will be reduced. Crude petroleum may with care be applied to healthy peach trees as strong as 20 or 25 per cent. of a mechanical mixture with water, but it is very difficult to mix properly, and if applied carelessly or by reckless or inexperienced men there is great risk of the trees being killed. It is not always easy to detect when a tree is enfeebled, and injury may sometimes result to trees which are apparently healthy, but which on examination will be found to have suffered from some other cause. In applying crude petroleum, experience seems to show that one great difficulty is to get a pump which will always throw the exact percentage of oil that is shown by the oil gauge. A perfect pump has never yet been produced and this has always been a difficulty. When in Ohio recently, the speaker was much pleased to hear the London Spramotor Co. pump spoken of in the highest terms, but even this is susceptible of considerable improvement. Another danger may arise from the operator going over his work twice, and of course in that way depositing on the tree twice the percentage of oil necessary. Mr. Fisher's plan is to use not more than one quart of crude oil costing 2 or 3 cents to each tree. The crude petroleum has two great advantages over other remedies if experiments will show us how we can use it without danger to the trees. It is exceedingly cheap, and it leaves a deposit on the trees even after the volatile portion has evaporated. This deposit is vaseline and has the double advantage of showing clearly on the trees what parts have been sprayed and at the same time rendering the bark unsuitable for the young scales to settle upon.

[Some striking examples were here exhibited of bark taken from the two sides of a badly sprayed tree, one showing plainly the residue of the petroleum and no living scales, the other showing no sign of oil and thickly caked over with living scale insects. One piece of bark had on one side of it masses of dead scales as far as the oil had reached and beyond that, where there was no oil, a thick coating of living scale insects.]

Crude petroleum, therefore, is an effective remedy, but great care must be exercised in using it. The great danger will be next year. Carefully watched over and helped by Prof. Webster and his assistants in Ohio and by Mr. Fisher and his assistants in Ontario, remarkably good results have been obtained by some fruit growers; very little harm has been done to peach trees and none at all to apple, pear and plum trees. This state of affairs might probably engender a spirit of recklessness, and the speaker was afraid that next year there would be much loss from fruit growers using the crude oil recklessly or carelessly. There was no doubt at all that many who had even purchased crude oil this year had abstained from using it, for fear of injuring their trees, but had watched the outcome of their neighbours' experiments. As no cases of injury had occurred, a great many trees would be treated next year. It was therefore most important to advise caution.

(3) Fumigation. The most effective remedy is fumigation with hydrocyanic acid gas, which will destroy every living insect, but which if applied as recommended will do no harm at all to the trees. For small trees this has proved very useful, but for large trees the necessary tents and apparatus are expensive and there are difficulties which have yet to be overcome in the way of getting the gas equally diffused beneath the tents.

Summing up what he had brought before the meeting, Dr. Fletcher claimed that, notwithstanding the great danger which still exists from the presence of the San José scale in Canadian orchards, the experiments of entomologists had provided remedies which were as practicable and as effective as those which were used for many other injurious insects, and that by their regular use trees could be kept in health and in a bearing condition. He would not believe that the extermination of the San José scale from Canadian orchards was an impossibility. What could be done on one tree could be done on many. Combination, and

co-operation were what was most needed in this matter, and, in the same way that farmers did not nowadays thresh their own grain but had this done for them by men who made a special business of doing it, he looked forward to the time when expert sprayers who knew their business, would travel from place to place spraying orchards for the various insect enemies. By this means, better work would be done and at a smaller cost than if each fruit grower did his own work. Fruit growers must remember that the application of these remedies was no easy matter which could be attended to by an untrained man. The Ohio and Ontario work were one huge experiment which was being keenly watched by scientific men and political economists. It was not a matter of the prosperity of a few individuals and the protection of their orchards, but of the discovery of a practical means of saving one of the most important industries of the country. This was not to be calculated by a few thousand dollars but by millions, as any one could see who would consider the amount of capital invested in orchards in Canada and the United States and then visit the dying neglected orchards.

It was a matter of congratulation that Prof. Webster was present; he is one of the most highly esteemed of the scientific workers in entomology in the world and has taken up this matter; nor was the Province of Ontario less fortunate. Mr. Fisher's enthusiasm and his peculiar adaptability for the delicate and difficult work which he had undertaken were apparent to all. The speaker trusted that these gentlemen would continue their important experiments in the directions which they had explained to him, and he felt convinced that substantial advance would be the result of another year's investigations. The Society had invited Prof. Webster to be present at this meeting, knowing that his advice and suggestions would be of extreme value. Mr. Fisher has been for some years a member of our Society, and we all know how reliable he is.

PROFESSOR WEBSTER, of Ohio, was next called upon to address the meeting. He said that the problem they had to solve in Ohio was exactly the same as in Ontario, and it was the most tremendous the world had ever had to face as regards insects. He was constantly asked for a *cheap, easy and perfect* remedy, but such was not to be had; however nearly it approached perfection it could not be easy nor could it be very cheap. Machinery was required which could not be produced in a day, but would be the result of long-continued experiments and constant improvements. He had not yet been able to find a good sprayer; the best so far made [it was gratifying to hear] was made in London, Ontario, by the Spramotor Co., but it was capable of improvement. In time, no doubt, we shall get what we want. It was the same with insecticides; we have not yet found out the very best materials and their combinations.

We know that countries differ, and that fruits which flourish in one region cannot be successfully grown in another. And so it is with insects; they vary very much in numbers and in injuriousness in different localities; some, for instance are destructive in Southern Ohio which do no harm in the northern part of the State. What people expect us entomologists to do is to provide them something that can be put in an orchard at no cost, and with no attention will kill all the noxious insects and not affect the beneficial ones.

(He then described the construction of fumigating houses, and stated that they had made them with slatted floors so that the deadly materials could be shoved under without danger.)

In addition to good apparatus, trained men were also wanted in order to do the work properly, just as skilled men were required for driving an engine. Such men should be provided with good machinery and then go about the country. They could do the work far better and much cheaper than untrained men; there was an opening here for a paying occupation. And it was one in which almost continual employment could be obtained; for instance, in July there would be the spraying of vineyards with Bordeaux mixture, later on the fall treatment for scale, all winter the same treatments, in the spring spraying for codling-moth, plum curculio, etc., then Bordeaux mixture, and so on—something to do nearly all the year round.

In Ohio, trees hopelessly attacked with the scale are marked for destruction and the owner is compelled to destroy them. Others less badly infested must either be destroyed or sprayed with whale-oil soap or crude petroleum and water, and the owners are held responsible for any damage arising from neglect.

At the present time, if remedies are properly used, we can reduce the scale 90 per cent. in one year : the other 10 per cent. cannot be exterminated. One tree might be absolutely cleared of the scale, but a whole orchard cannot. The condition of vitality of the trees makes a great difference. Thrifty young peach trees will stand 25 per cent. to 30 per cent. crude petroleum, while older and feebler trees were killed with 25 per cent. He now uses 20 per cent. of oil with one pound of whale oil soap. On the whole he considered that we are getting on as well as we can possibly expect.

DR. FLETCHER : Why cannot we kill the last 10 per cent. ? If we spray with crude petroleum this year there will be a covering of vaseline left on the trees ; this will be increased the second year and the third, and at length the tree will become unsuitable for the scale and free from danger of attack.

PROF. WEBSTER : There is no difficulty in treating apple-trees in this way and securing immunity ; but I was speaking of peach-trees which cannot stand the same amount of petroleum. I agree with Mr. Fisher that the heavier oil is the most satisfactory.

MR. FISHER stated that he had treated infested trees for three years in succession ; they recovered health and vigour, and bore fruit, and were not injured by the continuous treatment.

PROF. LOCHHEAD expressed his sense of the importance of the subject under discussion and his appreciation of the value of the information that had been imparted by the speakers.

HON. J DRYDEN said that he had listened with great interest to the excellent addresses of the speakers, and was rejoiced to learn that definite measures for the extermination of the scale could now be adopted. It was undoubtedly a most serious danger to the fruit industry of this Province, and every possible means must be employed for its removal. The difficulty at the outset was to persuade the public that this danger existed ; many people do not believe it even now. Nothing can be done to enforce remedies unless people believe in the deadly character of the scale. The application of the remedies must rest with the people themselves, but they must be taught what the remedies are and how they are to use them. This is what the Government should do and is trying to do.

But how are we to impress this upon the people ? The answer is by education—by teaching them first the danger and then the means with which to combat it. The Entomological Society and the Fruit Growers' Association could do good work in this respect. Every fruit grower in the Province must be impressed with the danger to his own fruit and also to that of his neighbour, if this scale is not repressed. At the beginning of the operations for its extermination, drastic methods were adopted because it was supposed that the scale was confined to a few spots only, and we wished to exterminate it. This system was continued till considerable opposition was aroused and some excitement was created. An endeavor was made to find out the range of the insect and what the cost of its extermination would be ; if the information received was correct, \$300,000 would have been required for compensation. If half a million dollars would wipe it out now the Government would gladly pay it. At present we are trying to hold it in check and to prevent its spread.

Educate, educate, must be their watchword. From now on we must strive to teach people about this scale—how to deal with it and what the danger from it is. It would be a great thing to teach people how to spray by sending competent men about whom they could see doing it ; no matter how plain written directions might be, they were of little use unless people were shown how to do it. This was the experience in improving the butter-making of the country.

The great danger lay in our nurseries, from which scale-infested stock might be sent out and the insect planted all over the country. We had an instance of this in the 100 trees two

years ago to which Mr. Fisher has referred. How is this danger to be overcome? Inspection alone is not enough, as some scales in a nursery may be overlooked even by the keenest inspector. The only plan then is to require compulsory fumigation of all nursery stock before it is sent out, and this must be done by a man sent by the Government, who shall see that the fumigating house is perfect and the work perfect. This is all that we now have to prevent with certainty the dissemination of the scale, but we shall have to go further and allow no stock to be sent out of a nursery that is in an infested district.

It is desirable that further experiments should be made with the gas treatment. The ordinary man will not believe that infested trees in the middle of a waggon load and tightly tied together can be reached by the gas. This should be tested. The fumigating house must be constantly inspected to see that there is no leakage, and this work must be done by an officer of the Government.

On the whole Mr. Dryden felt that we were in a better position now than this time last year, and he felt very hopeful for the future. He had great confidence in the efforts that were being made for the preservation of our fruit trees, and believed that if the danger were once fully and generally realized, our fruit-growers would spare no efforts to exterminate the scourge.

PROF. WEBSTER stated that he had tried infested trees soaked in water and others daubed with mud, and in no case had a scale got through the fumigating house alive.

HON. J. DRYDEN: There are thousands of trees in a nursery. If there should be only two or three scales on a small tree, how can inspectors tell their presence? It is therefore absolutely necessary to resort to fumigation.

DR. FLETCHER quite agreed with this, but considered the inspection of nurseries most important for the discovery of infested places and he believed it to be a very wise provision.

MR. FISHER said that an experienced inspector could discover the scales in a marvellous way, and would often detect them where the owner of the trees failed to see any. With regard to the 100 trees destroyed, already referred to, he considered that the destruction of each one was worth a thousand dollars to the country.

EVENING MEETING.

A meeting, to which the members of the London Horticultural Society and the public generally were invited, was held in a lecture room at the Normal School. Notwithstanding the inclemency of the weather, the first snowstorm of the season prevailing at the time, the hall was completely filled by a very appreciative audience. At 8 o'clock the meeting was called to order by the President, Rev. Dr. Fyles, South Quebec, who spoke of the honor done to the Society by the presence of the Hon. John Dryden, Minister of Agriculture for Ontario, and by his kindly consenting to preside that evening.

The Hon. J. DRYDEN then took the chair and delivered the opening address. He said that he esteemed it a great honor to preside over a meeting of the Entomological Society, which was one of the best as well as the oldest of the associations aided by the Government of Ontario. It had always been composed of gentlemen of wealth, of education, and above all of public spirit, who were willing to devote their time and ability to the objects of the Society. While it was one of the oldest, it was also one of the most useful associations connected with his Department in the opinion of a practical man like himself. We need its accurate work and we have been greatly aided and helped by it during all the nearly forty years of its existence; no doubt we shall continue to be helped by it during the years to come. He was present at this annual meeting to show his interest in the Society, and the interest which was taken in it by the Government and the Legislature of Ontario. He should like to inspire everyone with enthusiasm in the work of the Society which was doing so much for the country by its studies

of insect life both in its destructive and beneficial aspects. He congratulated the members on their extensive collections of insects and their library, which was the best of its kind in this country, and would be found most useful by young men of scientific tastes.

The REV. DR. FYLES, of South Quebec, read his presidential address and illustrated it with a number of beautifully executed colored diagrams, the work of his own hand. His charming manner and choice diction added to the interest of the subject, and held the unflagging attention which was bestowed by the audience.

THE IMPORTANCE OF ENTOMOLOGICAL STUDIES TO THE COMMUNITY AT LARGE.

BY THE REV. THOMAS W. FYLES, D.C.L., F.L.S.

The poet Crabbe gives us a glimpse of an entomologist of his day. He says,—

"There is my friend the Weaver: strong desires
Reign in his breast; 'tis beauty he admires:
See! to the shady grove he takes his way,
And feels in hope the raptures of the day—
Eager he looks: and soon, to glad his eyes,
From the sweet bower, by nature form'd arise
Bright troops of virgin moths and fresh-born butterflies;

* * * * *

"Above the sovereign oak, a sovereign skims,
The purple Emp'r, strong in wing and limbs:
There fair Camilla takes her flight serene,
Adonis blue, and Paphia silver-queen;
With every filmy fly from mead or bower,
And hungry Sphinx who threads the honey'd flower."

Crabbe wrote in no unkindly spirit, for he was himself a naturalist; but, by the general public of his time the entomologist was regarded as one who rode a useless hobby, as one who wasted his time in trivialities.

Yet, doubtless, it was better that the weaver should spend his leisure hours in the woods and fields, improving his health by exercise and fresh air, and having a definite purpose in view, than that he should idle them away in the frouzy haunts of men of his class. We may well believe that he would return to his usual avocations with greater courage, because of the pleasure and refreshment that his outing, amid—what Hood calls,—

"The boundless prodigality of nature,
The balm, the bliss, the beauty and the bloom,"

had given him.

For some years before Crabbe's death, the friendly Stephens, to benefit just such entomologists as Crabbe had portrayed, opened his doors on every Wednesday evening, and received both acquaintances and strangers alike—placing his books and his fine collections at their service, identifying specimens for them, and giving them scientific information.

Stephens died in 1852: but the Wednesday evening "at homes" were continued by Stainton, editor of "The Entomologist's Weekly Intelligencer," at his residence at Lewisham.

The services rendered to the cause of English entomology by Stephens, Stainton, Newman,* Douglas,† and others of their time, ought never to be forgotten. They raised entomology in public estimation; they changed many a mere collector into a useful man of science; and they prepared the public mind to welcome the publications of the entomological authors who came after them.

I think Stainton's "Manual of Butterflies and Moths" (in two volumes) was the most complete work of the kind—the best adapted to its purpose—that had then appeared. It was

*Editor of the "Zoologist" and author of the "Insect Hunters," etc.

†Author of "The World of Insects," etc.

cheap, readable and concise, sufficiently illustrated, and systematically arranged. It contained descriptions of larvæ, pupæ, and perfect insects, with the dates of their appearance and the localities, known to the author, in which they could be found. It also gave the names of the food-plants of the larvæ.

In 1859 Dr. Breckenbridge Clemens wrote to Stainton from Easton, Pennsylvania, and said : " With us (in America) everything has yet to be done." He also told of efforts that the authorities of the Smithsonian Institution were about to put forth ; and he predicted a bright future for American entomology. His prediction has been amply fulfilled.

In all probability Stainton's work was well known to the founders of our own society which is now in the 38th year of its existence, and which has done so much good. Some of the original members of the society are still among us. Long may they live ; and may their influence be felt in ever-widening circles !

I do not doubt that there are many to-day, especially among the young, who are, as yet, mere collectors. They stand, so to speak, within the vestibule of the Palace of Science, and they should receive a hearty welcome, and be encouraged to go forward, for there are noble apartments, well-furnished, open before them, and the farther they go the better they will be entertained.

The collector will soon wish to learn the names of his captures, and then the proper position of each with regard to the others, and so SYSTEMATIC ENTOMOLOGY will engage his attention. I would, therefore, urge parents and teachers to encourage a taste for Natural History in the young people under their care ; and I would adopt the words of Warwick James Price and say, Here's to the school-boy—

" Who one day in seven
Slips off to the country to find it a heaven,
And reads in the sunshine, the fields and the brooks,
A wisdom the truest, not printed in books."*

The tyro in entomology in this city has a very great advantage in being able to examine the Society's collections, in which a vast number of our Canadian insects are correctly arranged in their orders, tribes, families and genera, and are beautifully kept by our curator, Mr. Alston Moffat.

But I need not say that the Entomological Society of Ontario has far higher objects in view than those that appertain to RECREATIVE ENTOMOLOGY and SYSTEMATIC ENTOMOLOGY. Let any one examine its thirty-one annual reports, and he will find that what is known as PRACTICAL or ECONOMIC ENTOMOLOGY has received from it a vast amount of attention. It has investigated the habits and traced the life-histories of creatures that affect our growing crops, our stores and home-supplies, our live-stock, and our domestic and personal comfort ; and it has spread most valuable information as to the best methods of dealing both with our insect friends and insect foes. There is much that comes under the head of Practical or Economic Entomology to interest us all.

The subject of the Agency of Insects in the Fertilization of Blossoms has been brought before us by such writers as Percy Groom and Grant Allen ; and many interesting enquiries in this direction present themselves. For example : How is it that the Quebec farmers have to send elsewhere for their Red Clover Seed ? They can grow fine crops of Red Clover hay—why do they not raise the seed ? The answer may be given as follows :—

The insect that affects the fertilization of the Red Clover is the Humble Bee. On the approach of Winter all the Humble Bees perish, except one or two impregnated females from every nest. These creep into snug refuges and hibernate. The winters in Quebec are severe, and linger long ; and the few Humble Bees that survive them do not commence operations till

* "The Munsey," July number, 1896.

the very end of May. They have then to form their nests, collect bee-bread, and lay their eggs, and some time elapses before the working-bees begin to appear. Vegetation on the other hand proceeds with astonishing rapidity—with leaps and bounds; and the clover fields are in bloom before there are Humble Bees in sufficient numbers to accomplish the important work designed for them; and so the clover blossoms are, in the main, unfertilized, and afford but little seed. The season is too short to allow the ripening of seed in the rowen or after-math.

The Humble Bees are among our best insect friends; and yet how many a farmer on discovering a humble-bees' nest becomes possessed with an insane desire to destroy it.

The rough coats of bees are admirably suited to sweep the pollen from the anthers of flowers, and to convey it from blossom to blossom.

The pollen of plants is in itself well worthy of examination. It presents a remarkable variety both in form and color, as a few descriptions will show:—

The pollen-grains of the Orange Lily are ellipsoid, and of a deep Indian red.

Those of the Sun-flower are globular, and of a golden yellow.

Of Geranium the grains are round, warty and of the color of raw sienna.

Of Malva, the grains are round, set with spines, and of a pearly white.

The Sweet-pea has pollen-grains oblong in outline, and of the colour of amber.

The Petunia has grains egg-shaped and of pale lilac.

The pollen-grains of Mignonette are of a long oval, and are flesh-coloured.

A wide and interesting field for investigation is presented to the Entomologist and Botanist in the subject of the fertilization of blossoms by insect agency.

Scientists have of late made considerable advances into a field which, though not altogether unrecognized, had been but little explored—that of MEDICAL, OR HYGIENIC ENTOMOLOGY. Physicians have long studied that part of it which comes under the head of Dermatology, and have also written much upon internal parasites; but the subject of the spread of disease by the agency of insects has not until lately, entered largely into their studies.

Forty years ago a French-Canadian gentleman told me of a person who had died of "Charbon," resulting from the bite of an insect. He explained to me that the insect had, in all probability, made an attack upon a diseased animal before assailing the man.

In conversation with others, and in the course of years, I have heard of other cases of this Charbon or Anthrax, produced by insect agency.

That this terrible disease may be readily conveyed to human beings may be learned from the case of Mrs. Mary O'Neill, of Titusville, Pa. She, having washed the soiled linen of her husband who had handled infected hides in a tannery, was taken with anthrax, and died in a few days in great agony.*

The panic that ensued on the spread of the information that several persons had died from the assault of an insect popularly called the "Kissing Bug," viz.:—*Melanolestes picipes*, Herrich-Schaeffer, had at least this good effect—it drew the attention of Entomologists more closely to the subject of the spread of disease through insect agency.

Important investigations have been made as to the spread of malaria through the bites of mosquitoes; and the timely publications of Dr. Howard, of Washington, D.C., have thrown much light upon this subject, and given valuable information upon the various kinds of mosquitoes found in North America and their habits. His work (published by McClure, Phillips & Co., New York) should find a place in every Naturalist's library.

The ever-present House-fly, *Musca domestica*, has, under like investigations, risen in public recognition from a merely troublesome household pest, into the "bad eminence" of a possibly dangerous foe. It is found that it is capable of conveying the baccilli of disease from the sick chamber to the kitchen and the dining-room. For valuable information on this point I would refer

*Quebec Morning Chronicle, Sept. 16th, 1901.

you to a paper by Dr. Howard in Bulletin No. 30, New Series. U. S. Dep. of Agr.; one by Dr. Smith Ely Jelliffe in "The Munsey" for August of this year, and one by Dr. Fletcher, No. 3, vol. XXXIII of "The Canadian Entomologist."

We are beset by these insidious foes; and those who tell us of the dangers from them are public benefactors. "To be fore-warned is to be fore-armed."

Flies come from without; and pains should be taken to keep them without—as may be done by the use of gauze blinds and doors. Those that enter should do so to their destruction. Now that the fly-papers known as "Tangle-foot" are so cheap, and so effective, it ought not to be very difficult to keep the house free from flies.

Another subject that should raise the science of Entomology in the estimation of the public is that which may be called COMMERCIAL ENTOMOLOGY. And by this I do not mean the traffic in insects between dealers and collectors; though there are firms both in America and Europe doing a considerable business in this line. I have the price-list of an English firm before me; and it is curious to note the amounts asked, per pair, for some of our Canadian insects:—

For *Papilio Turnus*, 3s. 6d.

Colias Eurytheme, 1s.

Argynnis Atlantis, 5s.

Melitæa Phaeton, 1s.

Hemaris Thysbe, 3s.

Deilephila lineata, 2s.

Sphinx luscitiosa, 8s.

S. drupiferarum, 6s.

Ctenucha Virginica, 3s.

Prionocystus robinia, 10s.

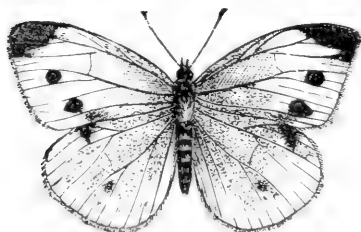
The covers of our Entomological magazines by their advertisements and notices, show that this kind of traffic is widely carried on.

No, I do not refer to this traffic when I speak of *Commercial Entomology*; I refer—

1st, To the unintentional transportation of insects from foreign lands by shipping, and their trans-continental conveyance by train, etc.

2nd, To the importation of insects, and insect productions, as merchandise.

(1) One night, in August last, my business took me along one of the wharves of the Louise Basin at Quebec. On one side of my path was a long store-house; on the other was an ocean steam-ship discharging her cargo. The whole scene was brilliantly lighted with arc lights attached to the building. I paused under one of the lights to notice the water-flies that had been attracted by it. Besides these, there were a few moths and a number of cockroaches (*Blatta orientalis*, Fischer). The last had, I doubt not, come from the ship. And I was reminded by them that their species was brought to England by ships trading to the Levant; and from England they have been sent to many lands. They have of late years become exceedingly numerous in Quebec.



House-flies have been carried in ships even as far as New Zealand; and where flies are found, there we may expect to see spiders. So we do not wonder that Henry Christopher McCook writes:—"Some of our American spider species have been imported from Europe, and I have seen them on vessels stowed away in divers crannies, and under sundry parts of the ship."*

Of imported insects that have made a stir in Canada, the Cabbage Butterfly (Fig. 3), the Larch Saw-fly (Fig. 4), the Mediterranean Flour Moth (Fig. 5) and the San José scale are examples too well known.

It is probable that *Zeuzera pyrina*, Fab., (The Leopard Moth), *Porthesia auriflua*, W. V., (The Brown-tail Moth), and *Ocnaria dispar*, Linn., (The Gypsy Moth), will some day find their way to Canada, as they have effected a lodgment in the States.

I am sorry to record the advent of the Buffalo Carpet Beetle (*Anthrenus scrophulariae*, Linn), to the Province of Quebec. I found it last July at Lennoxville and also at Sherbrooke. It had, I suppose, been conveyed to Canada in woollen goods from the United States.

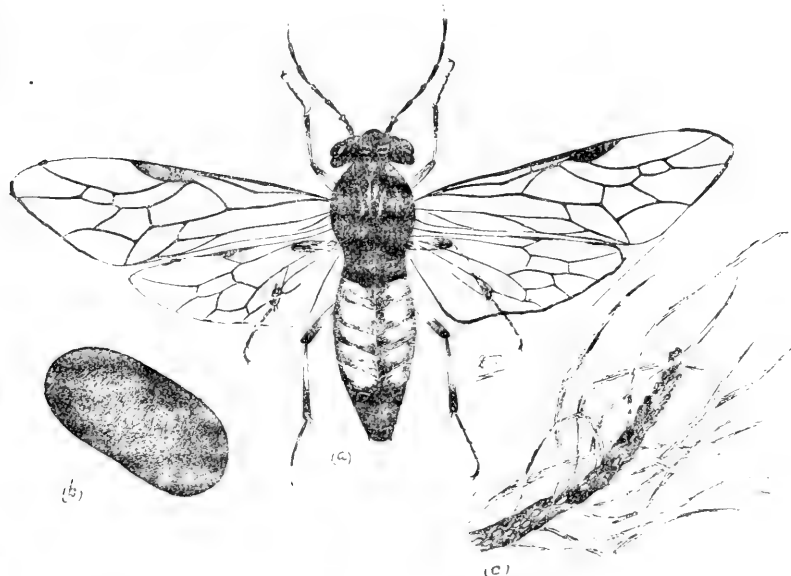


Fig 4. The Larch Saw-fly, cocoon and eggs.

It is worth a degree of attention that we cannot now give, as to whether the set of insect migration was originally from West to East, or from East to West; and how far the great land features of this continent have checked the spread of immigrant species; and to what extent climatic and other influences have affected their form and coloration.

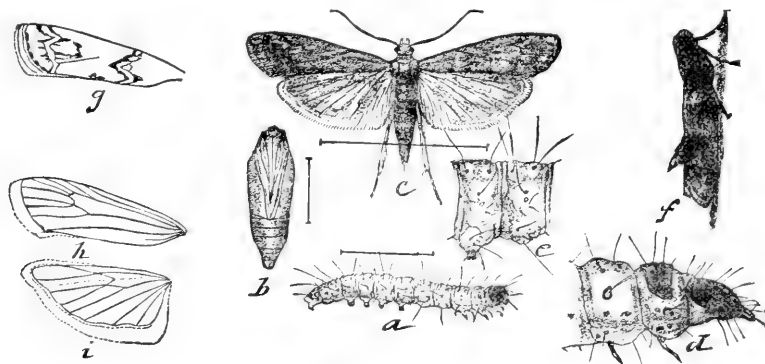


Fig. 5. Mediterranean Flour-Moth.

Some species of our British Columbian insect fauna seem to me to have a much nearer general resemblance to European species, than to those of Eastern Canada and the New England States. For examples:

Parnassius Clodius, Men., has a likeness to *Parnassius Apollo*, Linn.

Anthocharis Ausonides, Bdv., to *Pontia Daplidice*, Fab.

Melitea rubicunda, H. Ed., to *Melitea Artemis*, Fab.

Cenonympha inornata, Edw., to *Cenonympha Pamphilus*, Westwood.

Such questions as these might come under the head of GEOGRAPHICAL ENTOMOLOGY.

But it is (2) to the importation of insects and insect productions as merchandise that I would more particularly draw your attention. And first to the importation of silk and silken goods.

The silk manufacture has been carried on in China from time immemorial. Its beginning—like that of the cultivation of grain—has been lost trace of in the lapse of ages. In the third century of the Christian era, silk brought to Europe was of so much value that the Emperor Aurelian (most ungallant of men!) refused his wife a silk dress, on account of the cost.*

In the 6th Century two Eastern monks visited India and acquired a knowledge of silk culture. They secreted eggs of the silk-worm moth in the heads of their walking-sticks, and carried them to Constantinople. In the neighborhood of that city silk-culture was first practised. From thence it spread to Italy, and subsequently to France. On the revocation of the edict of Nantes in 1685, 70,000 Huguenots sought refuge in England and Ireland; and some of them established the manufacture of silk at Spitalfields and Derby.†

In the days of Queen Elizabeth silk-stockings were a costly luxury; and it is said that James VI of Scotland, on one occasion, borrowed a pair from the Earl of Mar, that he might present a respectable appearance before the English Ambassador.‡ In the fiscal year ending June 30th, 1899, the people of Canada indulged in silk hosiery to the value of \$4,119.

The total value of silk goods imported to Canada in the year mentioned was \$3,753,539, on which custom dues amounting to \$1,091,218.29 were paid.

Next in importance to the traffic in silk and silken goods comes that in honey and wax.

In Canada itself Bee-culture has been raised to great perfection; and vast quantities of wax and honey are obtained. But the home supplies are not equal to the demand. And so we find that, in the year mentioned above, 33,564 lbs. of bees-wax were imported from the United States. The value of this was \$3,941; and upon it \$894.10 was paid as duty. Of honey and "imitations thereof" 83,888 lbs. were imported—the value of which was \$8,579, and the customs duty \$2,482.97.

The importations of honey were of course small to those Provinces in which the home supplies were large, and, *vice versa*, large to those whose home-supplies were small, or altogether wanting. Thus by Ontario 98 lbs. only were imported, while to British Columbia 32,487 lbs. were sent; and to the Yukon, 49,694 lbs.

Large quantities of wax are used in the manufacture of candles for use in the elaborate ritual of the Roman Catholic Church. I lived for some time near a manufactory of these candles. The yellow wax came in sheets, which were blanched by being spread upon the grass and exposed to the air and the sunshine.

Next in importance to the trade in wax and honey is that in cochineal.

The cochineal insect, *Coccus cacti*, is raised in great numbers in Mexico. It is a suctorial insect, and its food-plant is the Nopal or Indian Fig, *Cactus cochinellifera*. Extensive plantations of cacti, or nopales as they are called, are formed on the mountain slopes; and there the Indians locate, watch over, and at length secure their charge. In appearance the dried insects resemble shrivelled berries, or grain. They are of a mulberry colour, and have a whitish bloom. It takes 70,000 of them to the pound weight. Of the cochineal brought into Canada in the time mentioned, 2,512 lbs. came through Great Britain and 30,675 lbs. through the United States. The value of the whole was \$1,708. According to the computation just made 232,309,000 dried Cochineal insects were brought to Canada in the year. The substance called Lac is a production of another *Coccus*, viz.—*Coccus lacca* which feeds on *Acacia arabica* and other trees. It is a

* Kirby and Spence's Entomology, Letter X.

† History of Insects, R.T.S., p. 153.

‡ Kirby and Spence's Entomology, Letter X.

native of India. Insects of the species crowd together, puncture the bark of their food-plant, and gradually become encrusted with a resinous matter which exudes from their bodies. This substance comes to us in its crude state, and also under different forms as shell-lac, button lac, sheet lac, etc. It is used in the composition of varnish, sealing-wax, etc., and in the colour called lac lake. 146 lbs. of lac valued at \$29 was brought into the Province of Quebec during the year mentioned, for home consumption.

One other production of insects must be mentioned here namely nut-galls, or Aleppo galls. They are caused by the punctures made by a Cynips, *Diplolepis gallæ-tinctoriæ*; and they abound throughout Asia Minor. They are gathered by the inhabitants, and exported from Aleppo (hence the name), and other ports of the Levant. They are used for dyeing purposes and in the manufacture of ink. 534 lbs. of these galls were imported to Ontario in the year mentioned, and 13,296 lbs. to Quebec. The whole being valued at \$1,065.

The total value of insects and insect productions admitted to Canada in the year ending June 30th, 1899, was \$3,773,832, upon which duties amounting to \$1,094,595.36 were collected. These figures show the importance to the community at large of what I have called Commercial Entomology.

But there are yet higher lessons to be learned in our consideration of insects than those which have reference to them as they affect our food supplies, health and business interests.

"All Scripture" we have learned "is profitable for doctrine;" and in the "Book of Nature," there are many "parables" which illustrate and enforce Divine truths. The student of well-balanced mind cannot advance far in the study of insects without perceiving that they bear ample testimony to the fact that there is a Divine Intelligence, an all-wise, all powerful and beneficent being who has fitted them to their surroundings; who has numbered their parts, and proportioned them with the utmost exactness; who has made them beautiful in their season; who has foreseen their requirements, and ordered all their ways, and whose goodness is over all His works. Who has, in short, made record of Himself in these, the works of His hands.

(1) God has adapted the insect to its environment.

Take for example the Giant Water Bug, *Belostoma grandis*, (Fig. 6). This creature spends a great part of its existence in the water, but comes forth, in its perfect state, to seek a mate, and to move to other waters. It lives by suction, preying upon fish and other denizens of the pools and streams. It is necessary that it should be able to float on the surface of the water and to dive beneath it; that it should have a quick sight, great powers of motion, a strong grasp, suitable breathing apparatus and mouth-organs, and powerful wings to sustain its large body in its aerial excursions. With all these it is admirably provided.

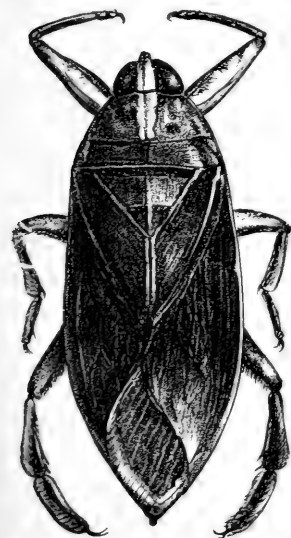


Fig. 6. The Giant Water Bug.

Its body is the shape of a well-proportioned wherry. Its hind legs are sweeps for propelling it through the water. The fore-legs are grappels, ending with sharp claws, to enable it to hold itself against a current or to cling to its prey; whilst the middle pair of legs serve to steady it, and also as rudders, to guide its course—the rudders of ships, you will remember were, in early days, placed upon the sides. The eyes of the bug are large and protuberant. The cornea is made up of a vast number of facets, which are hexagonal, and beautifully regular, both in size and shape. The proboscis of the insect is protected by a sheath or cover. The instrument itself is brown, and polished, and comes to a sharp point. Around the edge of the insect's abdomen, under its close-fitting wings, there is a smooth channel, though all the rest of the upper

side of the abdomen is covered with a thick brown pile, like that of plush. This channel is probably a receptacle for a supply of air, for use when the insect takes a plunge into the depths.

Who fitted the water-bug to the part it has to play? It did not fit itself. Man could not do so, any more than he, by taking thought, could add one cubit to his stature. or make one hair white or black. Did Nature? No—we do not deify Nature. There is a Divine Being who originated and controls natural forces—who designed this creature, so admirable in every part.

(1) The exactitude with which every species of insect is formed excites our admiration.

Consider the wasp (Fig 7). The male has 13 joints in the antenna: the female has 12—neither more nor less in either case. The male has invariably 7 segments in the abdomen, and the female 6. Then, moreover, the limbs of the wasp consist of five parts—coxa, trochanter, femur, tibia and tarsus; and in the tarsus there are five joints. Who counted out these things and fixed the rule? Who traced out the lines and spaces in the wings, so exactly that the species of the insect may be told from the wings alone? The same God of whom David wrote:—

“Thine eyes did see my substance yet being imperfect; and in Thy book all my members were written which in continuance were fashioned when as yet there were none of them.” Ps. CXXXIX, 16.

The God who counts and measures.

Who taught *Vespa Maculata* Linn. to build its wonderful nest of wood-pulp; and gave it the geometrical and mechanical skill to form its hexagonal cells (Fig. 8), and suspend them, tier below tier, in such a marvellous way?

The same God, “Who hath measured the waters in the hollow of His hand, and meted out heaven with the span, and comprehended the dust of the earth in a measure, and weighed the mountains in scales, and the hills in a balance.” Is. XL. 12.

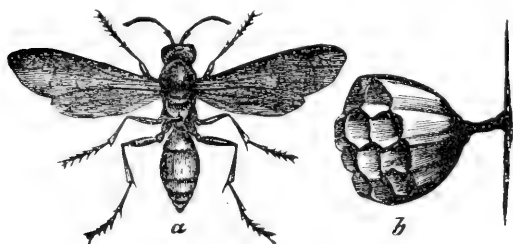


Fig. 8. Wasp (*Polistes*) and its Comb.



Fig. 7. A Wasp (*Vespa maculata*)

(3) What exquisite beauty does the insect world display to the admiring gaze of men. Who was it gave to *Philosamia Cynthia* its lovely dress of fawn colour embellished with delicate mauve, and ornamented with the pale lunettes to which it owes its name?

And who gave to *Phlegthontius cingulata* its wonderful gradations of colouring—its rings and vandykes, its bars of black and carmine, and its white-spotted borders? It was that Beneficent Being who delights in beauty and grace, who in love to His creatures has made all nature—

“Beauty to the eye,
And music to the ear.”

(4) In 1873, before the moth *Cossus Centerensis* had been named and described by Dr. Lintner, I found protruding from the trunks of Balsam Poplars growing on the banks of the Yamaska River a number of empty chrysalis cases of this species. I examined the bolls of the trees carefully and was rewarded by finding a fine female of the moth. I was not then sufficiently acquainted with the Cossidae to know that this belonged to a new species. I then peeled away some of the bark from one of the trees and found the mouth of a tunnel—over this I fastened a piece of netting—so as to form a bag; and, by this means, I secured a male of the species. I have the pair in my collection still.

Cossus Centerensis lays an egg in a crevice of the bark of a tree. The little caterpillar that comes from it bites its way into the wood. Its tunnel is at first a mere pin-hole, and is soon

closed by the *frass* it leaves behind it. As the larva grows it enlarges its tunnel till at length its instinct warns it to work upward and outward. This it does till it leaves only a film of bark between it and the outer air. It then retires some inches down its tunnel so as to be out of the reach of the sharp bill and long tongue of the wood-pecker. There it assumes its pupal form. When the time for the imago to appear approaches how can the footless chrysalis ascend its shaft and push its way through the screen of bark? Ah, that difficulty has been foreknown and provided against by Him, "who sees the end from the beginning." Around every abdominal segment of the chrysalis there are teeth or serrations in due order, which enable the chrysalis to secure a hold on the sides of its tunnel, to work its way up and to give it a purchase so that it can break through the closure of bark. It extrudes its body till the wing-cases are free, and then its skin is rent and the moth escapes.

Man learns by observation, experience and communication with his fellows, and provides against possible contingencies, but this creature, up to the time it leaves the chrysalis, has had no intercourse with its kind—has led a solitary existence, pursuing the course marked out for it. It has been ignorant of its future. It could not of itself provide either against danger or change. But its course, its wants, the means for its security and comfort, its entrance upon a higher existence, all these on the dawn of creation—

"Hid in God's foreknowledge lay."

The Grand Architect of the universe made careful and exact provision for the creatures of His hand.

The science of entomology abounds in lessons. To the consideration of the lovers of beautiful objects, of the young, of pleasure-seekers; of gardeners, fruit-growers and farmers; of merchants, store-keepers and house-keepers; of physicians, pastors and teachers; of thoughtful and pious men and women everywhere, I commend it. *It is of importance to the community at large.*

THE CHAIRMAN, Hon. J. Dryden, expressed the pleasure with which he, and he was sure all present, had listened to Dr. Fyles's interesting and instructive address. He then spoke of the powers of observation with which everyone is endowed, and impressed upon all the importance of cultivating this faculty to the utmost and obtaining the valuable results which would follow from doing so.

DR. JAMES FLETCHER, of Ottawa, Dominion Entomologist and Botanist, was next called upon to address the meeting. He spoke of "The Value of Nature Study in Education," and held the close attention of the audience during his half hour's address, of which the following is a brief outline:—"Nature Study," he said, was a very simple matter, but one which was often misunderstood. It was not a study of natural history but a training to enable us to observe and understand, as far as possible, everything that comes before us. It teaches a child to notice the common objects about it and to see far more than it otherwise would. The addition of the study of natural objects to the school and college curriculum would exercise a very useful and important influence. True education is the drawing out of the faculties to enable the child, when grown up, to use its mental powers fully and properly; nature study does this and is therefore the common sense of education, for it teaches a child not only to see but also to think. He then described how bad boys in school may be improved. They are generally active and restless, wanting something to interest them and to use their faculties upon; but get them to join in investigating some of the lovely natural objects about them, no matter how common they may be, and a bond of sympathy with the teacher is at once created and their restless spirits find something to expend themselves upon.

Some of the benefits of Nature study are that it compels people to realize that everything in a state of nature is absolutely perfect and beautiful; it leads the student to become habitually neat and methodical in all his work; it promotes habits of care and accuracy; it insists upon

all observations being absolutely truthful ; it inculcates a spirit of reverence and tends to make better men and women. Not only in the æsthetic side, but also in the economic and practical side is its study valuable, for it must be of great use to know what insects are beneficial, and which injurious, and what plants are noxious weeds to be got rid of or useful for some special purpose. In Manitoba a practical instance of the value of Nature study can be found. There the children are taught in the schools to know the common weeds and plants of the country. In every school thirty of the commonest plants to be found on the neighbouring farms are brought in for study, and these necessarily include several weeds. The children are taught that there are three kinds of plants, those that live one year, two years or many years and that of the last kind there are two classes—the deep and the shallow rooted ; that plants, like animals, must eat and drink, and that they do so by means of their roots ; and therefore, that if the roots are exposed to the sun and wind they starve and die. The result already is that the most troublesome weeds are known and recognized throughout the length and breadth of the Province, and the farms are now much cleaner than they formerly were. Some such plan ought to be adopted here, and great benefits would, in a few years, result from it. The attention of our children should be directed, not only to plants but to birds, insects, wild animals, anything in a state of nature that may be found in their own neighbourhood.

Dr. FLETCHER then spoke in warm terms of the great blessings we enjoyed in this Province, the excellence of our climate, the fertility of our soil, our freedom from devastating Cyclones, the absence of serious epidemics, our admirable liberty with just laws to punish the evil doer, and then drew the moral that we should use every effort to train up our children to be worthy of such an inheritance, and to be fitted for the development and utilization of all our splendid resources.

He then delighted the audience by an exhibition of lantern slides of plants, insects, and other natural objects, respecting each of which he gave clear and concise explanations as they were thrown upon the screen. The following are some of the objects exhibited : Plant lice, canker worms, codling moth, scale insects, cabbage butterfly, spruce gall louse, horse bot-fly, sheep tick, luna moth, walking stick insects, pollen, leaf of deutzia, sections of pine, hollow and solid wheat stems, lilac buds and stems, and a stem of corn, yellow columbine, the sundew, Venus's fly-trap, etc.

A cordial vote of thanks was then moved by Mr. J. H. Bowman, seconded by Rev Dr. Bethune, to the Hon. J. Dryden for his kindness in presiding over the meeting ; to Dr Fyles and Dr. Fletcher for their interesting addresses, and to Principal Merchant for the use of the room, and his valuable services in providing the lantern, and with Mr. Rennie's assistance, manipulating the slides

The Hon. Mr. DRYDEN, in acknowledging the vote of thanks, said that he had been much benefitted by his visit. His Department and the Entomological Society went hand in hand for the country's good, and each recognized the value of the union ; he hoped that their mutual interest would never flag.

The meeting then adjourned.

THURSDAY, NOVEMBER 14th, 1901.

The Entomological Society resumed its sessions at 11 a.m., the President, Rev. Dr. Fyles, in the chair. The first order of business was the reading of the Director's Reports on the Insects of the year, which were followed by remarks and discussions participated in by several of the members. After the Report of the Council had been read, the meeting proceeded to the election of officers for the ensuing year, which resulted as shown on page 2. The reports of the various branches, sections, and officers were read and approved.

In the afternoon a number of valuable and interesting papers were presented, some of them from want of time being read by title only ; rare and beautiful specimens were exhibited ; many

notes and observations were recounted, and when the hour of parting arrived (about 5.30 p.m.) general regret was felt that the sessions could not be continued for another day. All who were present enjoyed the meetings very much, and realized how full of value as well as of pleasure such gatherings are, when men of similar tastes can meet and discuss subjects that to them are of exceeding interest.

The following exhibits were shown by Dr. Fletcher :—A case illustrating the method which had been adopted in the arrangement of the cabinets of injurious insects at Ottawa. Several of the more important injurious insects of the year were shown in all their stages together with some of their parasites.

In two cases mounted specimens were shown of rare or interesting species, amongst these may be mentioned two specimens of *Sphinx Canadensis* taken at Ottawa by Mr. Arthur Gibson. This species bear a somewhat close resemblance to *Sphinx chersis* but has a general tinge of brown over the whole body, as well as different ornamentation on the wings and thorax. *Sphinx Vancouverensis* from Rev. G. W. Taylor, collected at Gabriola Island, B.C.

Heterocampa biundata—a very large and handsome specimen, collected at Ottawa in the middle of June.

H. marthesia—a perfect specimen reared from a larva found at Ottawa in 1900.

Homohadena badistriga—in all stages.

Mamestra atlantica—in all stages.

M. adjuncta—moth and larva.

Datana integerrima—larvae and moths.

Arctia virgo—showing larva with dorsal stripe.

Arctia arge—larva, from D. Brainerd, Montreal.

Alypia MacCullochii—moth and larva, collected at Banff, N. W. T.

Gluphisia severa—larvæ in all stages, and moths. Eggs received from Mr. J. W. Cockle, Kaslo, B. C.

Leucobrephos Middendorfi—2 perfect specimens received from Mr. Norman Criddle, of Aweme, Man.

Arctia phalerata—in all stages showing varieties, including females with yellow underwings.

Nemeophila Selwyni—bred from eggs collected at Nepigon, Ont.

Peridroma astricta—moths and the very beautiful larva reared from eggs sent from Kaslo, B. C., by Mr. J. W. Cockle.

Smerinthus ophthalmicus—in all stages from the egg to adult—reared from eggs sent by Mr. J. W. Cockle.

Arctia virguncula—in all stages reared from eggs sent by Mr. A. Kwiat, of Chicago.

Several beautiful specimens of Hydroecias and their work were exhibited. The larvae of these were sent to the Division of Insects by Mr. Henry Bird of Rye, New York, and beautiful specimens for the cabinet were reared and exhibited of the following species : *H. cerussata*, *H. necopina*, *H. marginidens* and *H. impecuniosa*. *H. cataphracta* was bred from Ottawa material, as well as *Achatodes zea* in considerable numbers, from the young stems of wild and cultivated elders (*Sambucus*).

The most interesting butterflies shown were *Erebia Vidleri*, from Mount Cheam, B.C.; *E. Rossii*, from Telon River, Y.T.; a specimen of *Pieris protodice* from Ottawa, and a very handsome specimen of the variety *Lintneri* of *Vanessa antiopa* in which the marginal band is $\frac{3}{8}$ of an inch wide at the widest part.

NOTES ON INSECTS OF THE YEAR.

DIVISION No. I.—OTTAWA DISTRICT.—By C. H. YOUNG, HURDMAN'S BRIDGE.

When Dr. Fletcher informed me on his return from the annual meeting of the Society in November of last year that I had been elected Director for the Ottawa district, I indeed felt greatly honoured at being appointed a member of the Council of such an important Society.

I regret however that owing to the remarkable absence, from a general standpoint, of all kinds of insects during the past season, that I was unable to make as many observations as I had hoped.

Tent caterpillars which had been so prevalent and destructive of late years in the Ottawa district were very scarce, and although I was on the look out for them, I failed to locate more than one nest—this on a wild plum tree.

The most abundant pest was the White Cabbage Butterfly (fig. 9), which occurred in remarkable numbers near my farm. In fact they were so prevalent at the end of June that they gave a decidedly white appearance to the fields when flying : as if a heavy fall of snow was in progress, or as if many people had torn up handfuls of small pieces of white paper and scattered them at the same time through the air. One of my neighbours had a great quantity of wild mustard growing in his fields, and the larvae were very abundant on these plants, and ate everything except the stems and flowers. They were, of course, very destructive to cabbages, and as soon as my neighbor set out his young plants the female butterflies immediately began to lay eggs on them, which in due course hatched, and the larvae quickly devoured the foliage. I advised my friend in time to dust his plants with pyrethrum insect powder, but as he considered that this was too expensive an operation he did not do anything and as a result lost all his plants. In August the larvae of the later brood were also very prevalent on turnips. I examined numbers of plants and was pleased to notice that a bacterial disease was at work among the larvae, most of them were dead and in a putrid condition.

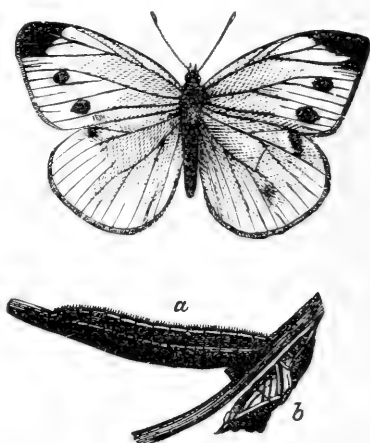


Fig. 9. White cabbage butterfly—
a, larva; b. chrysalis.



Fig. 10. Canker-worm—
a, male moth;
b, female.

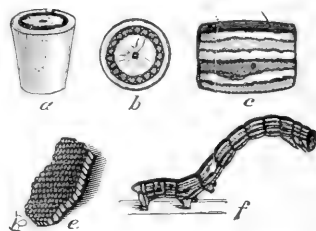


Fig. 11. Canker-worm, eggs
and larva.

In the spring of the year Canker-worm larvae (*Anisopteryx pomataria*) (figs. 10 and 11) were very abundant, especially on forest trees. Basswood and beech seemed to suffer most as far as I observed.

From about the middle of August until the early part of September Birch trees of all kinds were badly attacked by the larvæ of the Birch Bucculatrix (*Bucculatrix Canadensisella*.) (Fig. 12 shows an allied species which attacks apple-trees.) This attack caused widespread attention and as the larvæ were so abundant they soon stripped the trees of their foliage. Towards the end of August the attack was most noticeable, and at this time the leaves were quickly falling from the trees.

From the collector's standpoint insects were very scarce in this district during the past season. I, therefore, did not succeed in taking many species which call for special mention. I have during the year continued my work at breeding and inflating larvæ, and the following, which are shown in a case I have brought to the

Fig. 12. The apple Bucculatrix (*B. pomifoliella*)—a, cocoons on a twig; b, a single cocoon; c, the moth, greatly magnified.

meeting, are some of the species I have raised or collected the larvæ of:—

Papilio turnus—larva, chrysalis and imago; common.

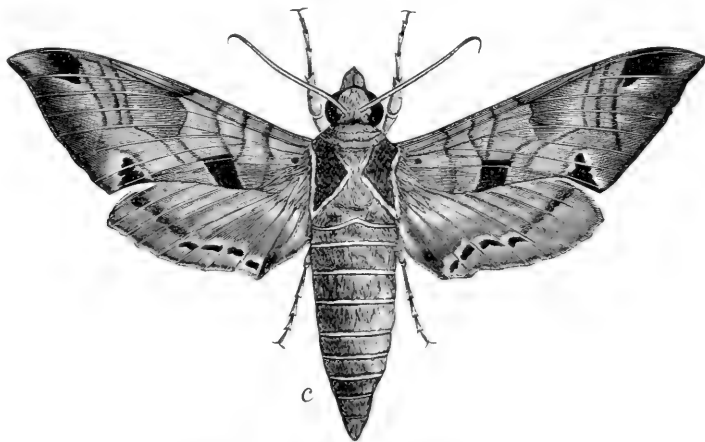


Fig. 13. *Philampelus achemon*—moth.

Grapta comma—dark and light forms of larva, chrysalis and imagoes. Larvæ were rather common this year on hop.

Philampelus achemon—larva (fig. 14), pupa and imago (fig. 13). This year I collected about 11 larvæ on wild Virginian Creeper.

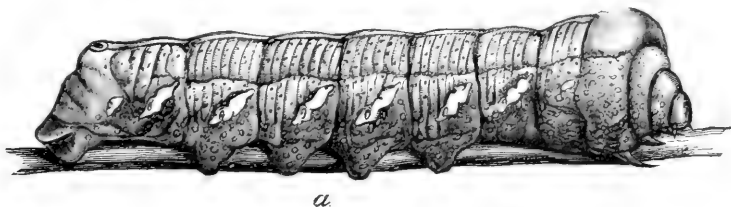


Fig. 14. *Philampelus achemon*—larva.

Deilephila chamænerii—larva, pupa and imago. Larvæ bred from eggs.

Ampelophaga myron—larva, pupa and imago—Larvæ uncommon at Ottawa as a rule.

Euprepia caja, var. *Americana*—larva and imago—species rather rare at Ottawa.

Arctia arge—larva and imago—very rare at Ottawa.

Orgyia leucostigma—larva and imago—bred from eggs collected at Toronto.

Parorgyia Clintonii—larva and imago—uncommon at Ottawa.

Euchaetes egle—larva and imago—larvae sometimes abundant on *Asclepias*.

Semioophora Youngii, Sm. This is a very beautiful Agrotid, the moths of which have been taken on the Mer Bleue, an extensive peat bog near Ottawa, during the past two seasons, and of which several specimens of the larvae were taken nearly full grown at the end of May, 1901, feeding on spruce and American Larch. Larvæ, pupæ and imagoes. For a description of this new species see "Canadian Entomologist," vol. xxxiv, page 29, (February 1902).

Arsilonche albovenerosa—larva, pupa, imago and parasites. Larvæ common at Ottawa.

Noctua bicarnea—larva and imago—common.

Noctua baja—larva and imago—common.

Noctua clandestina—larva and imago—common.

Mamestra lorea—larva and imago—larvæ common in spring under bark, etc. on the ground.

Hyppa xylinoides—larva and imago—rather common.

Homohadena badistriga—larva and imago—larvæ found on wild honeysuckle.

Abrostola urentis—larva and imago—larvae collected on nettle.

Alaria florida—larva and imago—larvæ occasionally abundant in seed pods of Common Evening Primrose.

Nomophila noctuella—larva and imago—common.

Balsa malana—larva and imago—larvæ on apple.

DIVISION NO. 2.—BAY OF QUINTE.—BY J. D. EVANS, TRENTON.

During the past season very few cases of depredations by insects have come to the writer's notice. *Clisiocampa distria*, which have been so very destructive in the recent past, were not observable this year, or were so few in numbers as to cause little serious injury.

The only noteworthy instance of a serious attack was that of *Lecanium Fitchi*, the bark louse, on the long blackberry; they were first observed on the 14th of June. On the 20th, six days following, samples of the canes were brought to the writer by Mr. W. A. Warner; he stated that he had half an acre of these berries, and his neighbours, a Mr. Arnott had about six acres and a Mr. Higgins 2 acres; these gardens are situated about two or three miles to the north west of the Town of Trenton. The canes, he said, were literally covered with these insects from a height of twelve or eighteen inches above the ground to the top; in one instance upwards of 150 were crowded within a space of seven inches on the stem. Bordeaux mixture and whale-oil soap emulsion had been applied but apparently with very little beneficial result. Upon making further enquiries and a personal inspection it was learned that Mr. Arnott was the principal sufferer, the others having very few, if any, of the unwelcome visitors. Several samples of these infested canes were forwarded to Dr. Fletcher of the Central Experimental Farm.

Upon examination with a lens it was seen that the majority of the shells, or cases, were filled with an immense number of eggs of a whitish color, and a few of the cases were tenanted with the larvæ of some insect. At this time the fruit was forming but before it ripened, the canes were swarming with the newly-hatched young, they however vanished without doing any appreciably serious injury to the fruit. After the fruit had been gathered the majority of the old canes were cut down and destroyed by fire; in a small patch near the dwelling house, however, the old canes had not been cut down and when on the sixth of the present month, (November,) the writer again visited this garden the new canes were found to be infested, but to a much less degree than the past season's bearing canes.

In June last, the writer placed two of the infested stems in a glass jar, covered with muslin, and awaited developments. About the 1st of July, the eggs began to hatch out and the young

appeared in great numbers, about the same time there also appeared three species of Chalcis flies, the larger species appeared first and numbered fifteen specimens in all ; then followed two other species much smaller in size of which there were forty-five specimens of one, and twenty-three of the other. No more of them making their appearance, after a few days, the jar was put to one side and overlooked for a time ; however, on the 11th of August, other prisoners were observed the majority of them being dead but in two or three instances they were alive ; these proved to be *Hyperaspis* four males and seven females of *proba* and one female of *signata*.

When examining the canes on the sixth inst. in Mr. Arnott's garden, it was noticed that some of them presented a peculiar appearance from the ground upwards, as if they were covered with a white fungus, upon close inspection they were seen to be scale insects of a species unknown to the writer, samples of which are herewith presented.

Since presenting the foregoing report Dr. Fletcher has very kindly obtained the names of the parasites, etc.

The small white scale above referred to, found on the blackberry, is the Rose scale (*Aulacaspis rosea*, Bouché, sometimes called *Diaspis rosea*). Dr. Fletcher remarks that this is a very bad pest.

The parasitic flies have been identified at Washington, D.C., as follows : No. 1, *Eucyrtus* (*Comys*) *fuscus*, How. No. 2, *Aphycus annulipes*, Ashm. No. 3, *Blastothrix* sp.

The following additional species were obtained from the blackberry canes sent from Trenton to Ottawa. No. 4, *Microterys*, sp. male. No. 5, *Coccophagus flavoscutellum*, Ashm. No. 7, *Eustochus xanthothorax*, Ashm. Dr. Fletcher says of this last, "a Mymarid described 15 years ago in Can. Ent. vol. 19, 1887, p. 193. This is an exceedingly minute creature which Mr. Guignard found in sorting out the material" and as reported by Mr. Ashmead, "it is the second specimen seen."

The fungus found infesting the Lecanium Prof. Roland Thaxter says "is evidently an immature *Cordiceps* of some sort, I thought at first *C. clavulata*, but the conidia are not those of that species."

DIVISION NO. 4.—HAMILTON DISTRICT.—BY JAMES JOHNSTON, BARTONVILLE.

We have had two very troublesome insects in this district this season, the Hessian fly (*Cecidomyia destructor* Say.) and the potato beetle (*Doryphora 10-lineata* Say).

The work of the Hessian fly was so great as to entirely ruin whole fields of wheat. I have seen fields that looked well and promising last fall and in the early spring so badly ruined as to render them not worthy of being harvested. The early sown fields were where the flies seemed to work the most destruction. The folks on this farm were so discouraged that they have sown rye instead of wheat this fall as a means of checking them.

About the beginning of June the general complaint was about the ravages of the potato beetles amongst the tomato plants. During my experience this has been a record year for these pests. One morning in early June four of us started to put out tomato plants where no beetles were to be seen, but after dinner they were so numerous on the plants set out that we had to leave off planting and turn to hand-picking the beetles. We found from one to thirty-seven on individual plants, so that an idea can be formed of our task of going over 18,000 plants, a task that had to be repeated for several days. If they would show themselves our work would not be so extensive, but the plagued things hide themselves away under lumps of earth when not feeding, so that it is necessary to be daily on the lookout for them.

The following are the only insects new to this district that I have to report for this year :—

As early as February a specimen of *Anthrenus scrophulariae*, Linn., was brought to me from a neighbor's house and later on I came across several.

Sept 28th *Crioceris asparagi*, Linn., (Fig. 15) made its first appearance on our asparagus, when I secured six specimens.

Oct. 10th I took a fine fresh specimen of *Pyrgus tessellata*, Scud. (Fig. 16). Saw another the week previous but failed to secure it.

In the discussion which followed upon the reading of the Directors reports, Dr. Fletcher referred to the little black Lady-beetle, *Pentilia misella*, in Canadian orchards, and said that while it is an object of great interest from its habit of preying upon the San José scale, it cannot be relied upon as of any great value for the destruction of the scale. It is still absolutely necessary to apply practical remedies and not wait for this little insect to perform the work.

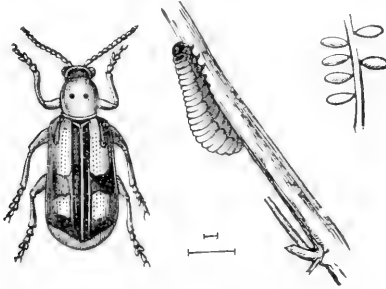


Fig. 15. Asparagus beetle, larva and eggs.



Fig. 16. *Pyrgus tessellata*.

PROF. WEBSTER said that the *Pentilia* was increasing in abundance in Ohio, but only late in the fall did it become numerous; the winter following reduced its numbers to such an extent that it took all the next season for it to recover its numbers, and consequently it was not of much help as a remedy for the scale. The Colorado potato beetle had been very bad on tomatoes in Ohio this year.

DR. FLETCHER said that it had also attacked tobacco grown in gardens at Ottawa. In speaking of the cabbage butterfly he recommended the Pyrethrum insect powder as the best means for destroying the larvae; it would be much too dangerous to apply Paris green to a vegetable that was afterwards to be brought to table.

REPORT OF THE COUNCIL.

The Council of the Entomological Society of Ontario begs to present its Annual Report for the year 1900-1901.

The thirty-seventh annual meeting was held in London in November, 1900, and was well attended both by resident members and those from a distance. On the first evening a joint meeting was held with the Horticultural Society in a lecture room at the Normal School. The chair was taken by Prof. C. C. James, Deputy Minister of Agriculture for Ontario, who delivered an interesting address on the value of horticulture in its various aspects and its intimate relation with Entomology. Mr. W. E. Saunders followed with a paper on "The planting, care and pruning of the trees in the parks and streets of the city," and Dr. James Fletcher gave an address, illustrated with lantern pictures, on trees and their methods of growth and on some especially injurious insects. The two following days were occupied with the reading of papers and reports, a discussion on the San José scale and the transaction of the business of the Society. A full account of the proceedings has been published and distributed.

The thirty-first Annual Report on Economic and General Entomology was presented to the Minister of Agriculture for Ontario in December last and was issued from the press in the following February. It contained 112 pages and was illustrated with forty-six figures in the text and a photogravure portrait of Mr. J. Alston Moffat, who has been the efficient curator and librarian of the Society for upwards of ten years. In addition to an account of the proceed-

ings at the annual meeting, it included among many useful and practical papers the President's address by the Rev. Dr. Fyles, in which he described the importance of insects in the fertilization of plants; papers by Prof. F. M. Webster on the codling-moth, the use of crude petroleum against scale insects, some species of Dermestidae and two longicorn beetles affecting nursery stock; by Prof. W. Lochhead on forest insects, the San José scale, the squash bug, and the silk industry in Ontario; by Mr. Moffat on Anosia Archippus and Parasites in the eggs of Chrysopa; by Dr. Fyles on the Dragon flies of Quebec; by Dr. Fletcher on the injurious insects of 1900 in Ontario; notes on insects of the year by the Directors, Messrs. Evans, Cox, Johnston and Rennie, and by Mr. Moffat; and papers by Messrs. Gibson, Gregson, Nash and Dearness. An abstract was given of the proceedings at the annual meeting of the Association of Economic Entomologists, and a short report of the second annual meeting of the North-west (Canada) Entomological Society.

The *Canadian Entomologist* has been regularly issued at the beginning of each month. The 32nd volume was completed in December last; it consisted of 387 pages, illustrated with thirty-three figures from original drawings and seven full-page plates. The contributors numbered sixty-four and included well-known Entomologists in Great Britain, Germany, Switzerland, South Africa, Brazil and Mexico, as well as in the United States and Canada. The 33rd volume will be completed next month; the eleven numbers thus far issued contain 316 pages and several original illustrations.

The Index to the thirty annual Reports of the Society, 1870 to 1899, was published in January last, and is for sale at a nominal price. To those who have occasion to refer to the Reports it must be of very great value.

Meetings for the study of Entomology were held during the winter, the order Coloptera being taken as the portion for consideration. The Geological and Ornithological Sections have held regular meetings throughout the year, the Microscopical Section during the winter months, after which the Botanical Section took its place. Public lectures of a popular character were given by Dr. Bethune on Entomological subjects before the London Horticultural Society, the Canadian Horticultural Association, and the Young People's Societies connected with the Bishop Cronyn Memorial Church and the South Wellington Street Methodist Church. Mr. W. E. Saunders also delivered lectures on the Birds of Canada, illustrated with lantern pictures, at the High School, Montreal, and before several teachers' meetings and church societies. One field meeting was held at Komoka on the 13th of July, and a goodly number of botanical and entomological specimens were obtained.

The Council desires to place on record its high appreciation of the services of Mr. J. A. Balkwill, who has filled the office of honorary treasurer for the last nine years and has now found himself unable to continue in the position. His books have been kept with great neatness and accuracy, and his attention to the business of the Society has always been prompt and satisfactory. Thanks are also due to Mr. Moffat, the Curator and Librarian, who has been indefatigable in his care of the library and collections, and has shown a constant zeal and interest in the welfare of the Society.

The Council here places on record its great appreciation of the scholarly and valuable work of the Editor of *The Canadian Entomologist*, the Rev. Dr. Bethune, who during the last thirty-eight years has been doing useful service for the advancement of entomology, not only in Canada but throughout North America.

The Council, in common with entomologists everywhere, deeply deplores the loss of Miss Eleanor A. Ormerod, one of our honorary members, who died on the 11th of May last. Her work in economic entomology has proved most valuable to husbandmen, gardeners and others in Great Britain and of much interest to scientific students in all lands.

All of which is respectfully submitted.

THOMAS W. FYLES, President.

REPORT OF THE MONTREAL BRANCH.

The 232nd regular and 28th annual meeting of the Montreal Branch of the Entomological Society of Ontario was held at the residence of Mr. A. F. Winn, 58 Bruce avenue, Westmount, on the 14th of May, at 8.30 p.m. The members present comprised Messrs. A. F. Winn (President), Dwight Brainerd, G. Chagnon, M. W. Davis, J. B. A. L. Leymarie, Henry H. Lyman, G. A. Moore, A. E. Norris, C. Stevenson, and L. Gibb.

The chair was taken by the President, and the minutes of the previous meeting and the last annual meeting were read and confirmed.

The President then submitted the following report of the Council for the past year :—

Your Council have pleasure in presenting the following report of the Society's work during the season 1900-1901 :

Eight regular monthly meetings have been held, the average attendance being ten.

A field day was held at St. Hilaire, on May 24th, which was a very successful and enjoyable outing.

The following papers were read at the meetings :—

Life History of <i>Euchutes Oregonensis</i>	Henry H. Lyman.
Note on the Emergence of a Gall Insect.....	A. F. Winn.
Notes on the Past Season (1900).....	A. E. Norris.
Methods of collecting Lepidoptera.....	H. H. Newcomb.
Notes on Walker's Types of <i>Spilosoma congrua</i>	H. H. Lyman.
<i>Danais Archippus</i>	J. B. Williams.
A Fortnight at Biddeford, Maine	A. F. Winn.
<i>Ephestia Kuhnella</i>	Dwight Brainerd.
Notes on Hybridity of Lepidoptera, Papers by Miss Morton, Newburgh, N.J., and H. H. Newcomb, Boston, read by the President.	
Notes on the Larvæ of <i>Scopelosoma Morrisoni</i> <i>S. tristigmata</i> , and	
Description of the Larvæ of <i>S. Graefiana</i>	H. H. Lyman.
Entomological Chemistry.....	C. Stevenson.
Life History of <i>Vanessa Antiopa</i>	A. E. Norris.
Commercial Entomology	C. Stevenson.
A Query Regarding the Death of Insects.....	A. F. Winn.
<i>Paridisca Scudderiana</i>	Dwight Brainerd.
Notes on <i>D. archippus</i>	H. H. Lyman.
Among the Lycenæ in England	L. Gibb.

Two new members, Messrs. J. B. A. L. Leymarie and E. Denny, have been added to our roll, but we have also lost, through the sudden death of Mr. E. T. Chambers, one of our most regular attendants at the meetings. Mr. I. B. Williams has moved to Toronto where he will, doubtless, join the Toronto branch. Dr. Wyatt Johnston and H. N. Cowan have resigned.

The book-case ordered for us is in place in the library of the Natural History Society : the few books in it will form a nucleus for a future collection of literature on our favourite subject.

The subject of the formation of a general collection of insects for our Branch was given a good deal of time and attention, and it was unanimously decided to make a beginning. A dozen drawers and a case of sufficient size to contain thirty have been ordered, and we hoped to have had the cabinet ready for donations before to-night's meeting ; such would have been the case but for the death of Mr. Priddy of Toronto, who had the order.

The work on this case is being completed and word of its shipment is expected any day. The members are especially requested to do their best to make the collection as perfect and

useful as possible. Through the kindness of Miss Morton we have already received a fine collection of Hybrid Attaci.

The report of the Treasurer submitted herewith shows that we still have a considerable balance to our credit.

Respectfully submitted on behalf of the Council.

(Signed) A. F. WINN,
President.

The Librarian then made his report, and it was moved by Mr. Charles Stevenson, seconded by Mr. G. A. Moore, that the reports of the Council, Treasurer, and Librarian, be received and adopted. Carried.

The Treasurer submitted his report, shewing a balance on hand of \$48.90.

The President then read his annual address.

The following officers were elected for the ensuing year ;—

President.....	G. Chagnon.
Vice-President.....	C. Stevenson.
Librarian and Curator.....	A. E. Norris.
Treasurer and Secretary.....	G. A. Moore.
Council.....	{ Henry H. Lyman. A. F. Winn. Dwight Brainerd.

Moved by Mr. A. E. Norris, seconded by Mr. C. Stevenson, that a regular meeting be held in June this year.

Moved by Mr. G. A. Moore, seconded by Mr. J. B. A. L. Leymarie, that a field day be held at Beloeil on the 24th inst. Carried.

Mr. A. F. Winn moved, seconded by Mr. M. W. Davis, that a committee on outings for the summer be formed to consist of Messrs. G. Chagnon, C. Stevenson, and A. F. Winn. Carried.

Mr. L. Gibb exhibited a number of Lepidoptera collected in the Yukon in the season of 1900.

After the examination of specimens and discussion, the meeting adjourned.

G. A. MOORE,
Secretary.

REPORT OF THE QUEBEC BRANCH.

At an adjourned meeting held at "Darnoc," the residence of James Geggie, Esq., on the 22nd June, 1901, the President gave an address, the Report of the Council was made, and the officers for the current year were chosen, as follows :

PRESIDENT'S ADDRESS.

We have now entered upon the fifth year of our Association as a branch of the Entomological Society of Ontario.

Since the formation of the Branch we have had many happy gatherings in which conversations have been held and papers read upon the subject of animal and vegetable life and upon the beauties and wonders displayed in the natural objects around us. We have, moreover, enjoyed much social intercourse and many delightful visits to places of interest in the neighborhood of Quebec. Not a few choice specimens of natural objects have been taken by our collectors.

It is hoped that the season we have now entered upon will be as fruitful in pleasant associations as those that have gone before, and that our Branch will continue to flourish.

Among the subjects that during the past year have engaged the attention of practical entomologists have been :—

1. The increased destructiveness of, and the preventives against, that most injurious creature, the San José scale. Professor Lochhead, of the Ontario Agricultural College, has issued a valuable paper upon this pest.

2. Much thought and ability have been brought to bear by Dr. Howard, of Washington, upon the mosquitoes and the danger that exists of the conveyance of disease by them from fever patients to healthy persons. The subject is one of very grave importance.

3. The subject of the Green Pea Aphis was brought under the notice of the members of the Entomological Association at its last annual meeting by Dr. Fletcher. The Green Pea Aphis is a pest that is doing much damage to the pea crops. It has been found destructive along the Atlantic coast, in some of the Western States and in parts of Canada. Several references to it are to be found in the Society's last annual report and will be found interesting.

4. The question as to the practicability of the cultivation of silk in this country has been considered. Professor Lochhead has looked carefully into the subject and has come to the conclusion that, although the climate of Ontario is suitable for silk-culture, and the Orange-Orange, a fitting food-plant for the silk-worm, can be freely grown, there is one great preventive to the introduction of the industry, viz., the lack of cheap labour. This is such that it is thought our people could not compete with the foreign growers.

I think the subject should not be allowed to drop but should be further looked into, for, during the fiscal year, ended June 30th, 1899, silk and silken goods to the value of \$3,752,539, were imported into Canada, and upon them duty amounting to \$1,091,218.49 was paid.

It may be interesting to learn that our Quebec people indulged in silk handkerchiefs during the year to the value of \$24,489 and in silk hosiery to the value of \$1,174. In this respect they exceeded the Ontario people who only expended \$939 ; but they fell short of the people of British Columbia who laid out \$1,875 in silken foot-wear.

In sewing and embroidery silk, Quebec expended \$8,700, more than one-half the expenditure of the whole Dominion, which speaks well for the industry of its ladies in certain directions.

An important work well done has been issued by the society, viz :—a " General Index to the Thirty Annual Reports of the Entomological Society of Ontario, 1870-1899, prepared by Rev. C. J. S. Bethune, D. C. L., Editor of the *Canadian Entomologist*". The cost of this useful compilation to members is 25 cents per copy unbound and 50 cents bound in cloth.

Our branch has suffered from the loss by death and removal of some of its members. It is hoped that new additions will keep up our numbers.

REPORT OF COUNCIL.

The branch now includes 42 members (33 adults and 9 juniors).

The Treasurer's Report is submitted and will no doubt be found satisfactory.

The continued rainy weather of last summer prevented the members from having many field-days but two very enjoyable ones were held on the 16th June and 14th July.

Our thanks are due to the authorities of Morrin College for having continued to allow us the use of their rooms for our meetings.

CRAWFORD LINDSAY,

Secretary-Treasurer.

The following were elected officers :—President—Rev. Dr. Fyles, Vice-President—Miss E. MacDonald, Council—Hon. R. Turner, Mrs. R. Turner, Mr. J. H. Simmons, Miss Bickell, Miss Winfield, Mr. James Geggie.

LT. COL. CRAWFORD LINDSAY,

Secretary-Treasurer.

REPORT OF THE LIBRARIAN AND CURATOR.

FOR THE YEAR ENDING 31ST OF AUGUST, 1901.

Thirteen bound volumes were received from Governments, Societies and Scientific Institutions during the year.

Two were obtained by purchase, one of which is the Century Atlas of the World.

One was presented to the Society by the Rev. Dr. Bethune, making sixteen bound volumes altogether.

Fifteen volumes were bound and placed on the shelves, making a total of thirty-one volumes added to the Library during the year.

The full number of volumes now on the register is 1,722.

Thirty-three volumes were issued to local members during the year.

There have been few additions made to the native collection during the past season, and nothing of special importance has been reported as having been taken in this locality.

An important addition was made to the exotics by the receipt of a collection of Japanese beetles; many of them being large and attractive specimens. A small collection of West African insects was presented to the Society by Mr. T. H. Hill, who has recently returned from that region, where he was engaged in missionary work for about seven years.

Respectfully submitted,

J. ALSTON MOFFAT.

AUDITORS' REPORT FOR THE YEAR ENDING AUGUST 31st, 1901.

RECEIPTS.		EXPENDITURE.	
Balance on hand, September 1st, 1900..	\$492 71	Paid for pins, cork, etc.....	\$60 09
Sales of pins, cork, etc.	72 12	Expense account (postage, etc.).....	139 14
Advertising	31 85	Printing account.....	717 55
Sales of Entomologist.....	151 97	Annual meeting and report	163 28
Government grant.....	1,000 00	Library account.....	42 09
Members' fees.....	395 04	Salary account.....	375 00
Interest	11 51	Rent.....	175 00
	<u>\$2,155 20</u>	Balance, August 31st, 1901.....	483 05
			<u>\$2,155 20</u>

We, the Auditors of the Ontario Entomological Society, have examined the books of the Treasurer, compared them with vouchers and find them correct, and certify that the above is a true statement.

JAMES H. BOWMAN, }
W. H. HAMILTON, } Auditors.

REPORT OF THE MICROSCOPICAL SECTION.

The Microscopical Section of the Entomological Society of Ontario beg leave to present their annual report as follows :—A meeting for the purpose of re-organizing was held on February 22nd, 1901, when the following officers were elected :

Chairman.....	Dr. Bethune.
Secretary.....	E. A. Brown.
Committee.....	{ John Dearness. J. A. Bowman. R. W. Rennie.

On account of the lateness of re-organizing, only four meetings were held, with an average attendance of eight, as well as visitors.

During the season four papers were read—

- (1) Microscopical Examination of Crystals.....J. H. Bowman.
- (2) Microscopical Examination of Bacteria.....R. W. Rennie.
- (3) Dermestes.....J. Dearness.
- (4) Pond Life.....J. H. Bowman.

Besides these short notes on interesting subjects were read, and many very interesting slides of microscopic plants, crystals and insects were examined.

The Section gave an entertainment by request in the school-room of the Bishop Cronyn Memorial Church; an address on "Mosquitoes and Malaria" was given by Dr. Bethune, followed by an exhibition of microscopical objects by Messrs. Bowman and Brown; the attendance was large and all were greatly interested.

CHARLES J. S. BETHUNE,
Chairman.

EDGAR A. BROWN,
Secretary.

REPORT OF THE BOTANICAL SECTION.

The re-organization meeting of the Botanical Section of the Entomological Society of Ontario was held on May 4th, 1901, when the following officers were elected:—

- | | |
|--------------------|-----------------------|
| Chairman..... | R. W. Rennie. |
| Vice-Chairman..... | Dr. C. J. S. Bethune. |
| Secretary..... | E. A. Brown. |

Eight meetings were held during the summer, commencing May 11th, and every alternate Saturday evening thereafter, with an average attendance of seven, besides visitors. A very pleasant and profitable field-day was spent at Komoka on July 13th. At each meeting interesting subjects were discussed, and objects of interest reported. Six papers were read, viz.:—

- (1) The Study of Botany with the CameraR. W. Rennie.
- (2) A Trip to Sable Island.....W. E. Saunders.
- (3) Pond-net (*Hydrodictyon Utriculatum*).....J. H. Bowman.
- (4) Collecting Native Orchids.....Dr. C. J. S. Bethune.
- (5) Hydra.....J. H. Bowman.
- (6) FungiJohn Dearness.

R. W. RENNIE,
Chairman.

EDGAR A. BROWN,
Secretary.

REPORT OF THE ORNITHOLOGICAL SECTION.

The year has been marked by a vigorous prosecution of Ornithological work, though not by any growth in the membership. Two regular meetings were missed on account of uncontrollable circumstances, and one extra meeting was held in July. At the nine meetings held a total of thirty-two members were present, averaging less than four to each meeting.

Three of these meetings were spent informally in the examination of the collections of Messrs. Keays, Gould and Saunders, and at the remaining six meetings ten papers were read as well as a number of shorter notes on interesting subjects. The papers read were as follows:

"The Acadian Owl in Captivity," F. Norman Beattie, Guelph.

"Concerning Woodpeckers," Robert Elliott, Bryanston.

"The Birds of Algoma," Rev. C. T. Scott, London.

"The Extinction of the Elk," and "The Woodcock's Love Song," L. H. Smith, Strathroy.

"The Buff-breasted Sandpiper," Dr. G. A. McCallum, Dunnville.

"Humming Birds," "The Grasshopper Sparrow," and "Notes on Sable Island," illustrated by skins and the very rare nest and eggs of the Ipswich Sparrow, as well as other birds, photographs and curios from the Island, W. E. Saunders, London.

"The Habits of the Saw-whet Owl," Wm. H. Moore.

Five of these papers have appeared in the *Ottawa Naturalist*, one in *Forest and Stream* and the remaining four will probably come out in the *Naturalist*.

Three new birds have been recorded for the county in which the members of the section reside, namely: The Glaucous Gull, the Golden Eagle and the King Eider Duck. Short notes on each were written, and two of these have already been published in the *Ottawa Naturalist*, and the two former specimens were exhibited at the Section's meetings.

The migration lists for the year have been compiled, shewing a large number of species noted in their migrations by members.

A list of the birds of Middlesex County is in course of preparation and may be completed during the coming year.

The Opossum, a mammal not recorded in recent years in Ontario, has been noted in two places, one specimen having been taken near Port Colborne, and two at Rond Eau. The occurrences have been duly noted at the meetings.

Mr. Robert Elliott has identified a skull of a local skunk as *Chincha pulida*, the Eastern skunk. The official skunk for northern Ontario from Nipissing to Rainy River is the Canada skunk, *Chincha mephitis*, which we have yet to find.

Interesting discussions have, of course, taken place on many subjects recorded on the minutes but not referred to in this report.

During the past year addresses and demonstrations have been given on Ornithological subjects to teachers and other assemblies by members of the Section as follows: By Mr. W. E. Saunders to the Teachers' Association meeting at Easter; the Boys' Club of St. James's Presbyterian Church; the Epworth League of the Wellington Street Methodist Church; a farmers' meeting at Derwent, Ont.; a lecture, illustrated with lantern slides, on the Birds of Canada, at the High School, Montreal, under the auspices of McGill College; the same lecture was repeated in London at the First Methodist Church, the First Baptist Church and to the Epworth League of the Dundas Centre Methodist Church. By Mr. H. Gould to the teachers of the Lorne Avenue Public School and to the Kindergarten, Lorne Avenue, London.

J. E. KEAYS, Chairman.

W. E. SAUNDERS, Secretary.

REPORT OF THE GEOLOGICAL SECTION.

The Geological Section of the Entomological Society of Ontario begs leave to present its annual report.

Meetings were held weekly throughout the year, excepting the usual summer vacation. Geological studies were actively prosecuted and field work was done in several localities in the south western peninsula. Amongst other places visited were Grand River Valley, near Galt; 2, Sydenham Valley at Alvinston; 3, Corniferous and Hamilton formations in Bosanquet. The specimens obtained were placed upon the table and after study went to increase the various collections of the members of the Society.

The Chairman of the Section made interesting reports upon his trips to the locations above named. For the first time the Corniferous strata has been made a special study, being fully exposed by operations having in view the drainage of lands adjacent to Mud Creek, which empties into the Sauble, near Port Frank. Fine specimens of *Orthoceras* from two to three feet in length were found, many being broken by explosives used in blasting away the rock. A very perfect specimen, one foot long, was shown to the class. *Spirifers* of larger size (*Spirifer striatus*) were found very abundantly in beds of clay above this formation, also a number of other fossils, *Murchisonia* being the chief.

Because of the great excess of silica the use of the rock is very much restricted, being too hard and too fragile and also containing iron, which makes it unsuitable for building purposes. This is in decided contrast to the formation exposed at St. Mary's, where the Corniferous is remarkably free from silica and contains an abundance of fossils of the Devonian Period and occasionally the remains of fossil fishes are found.

The Hamilton formation immediately overlies the Corniferous at Arkona, where it is exposed by the Sauble River. This vicinity is well known as one of the finest collecting grounds in the world. Many distinguished scientists have visited the Sauble Valley, amongst others Prof. Hall, New York; Prof. Winchell, Ann Arbor, and many others Geologists of lesser note. Here trilobites abound, the characteristic species being *Phacops Bufo*. Fossil corals, also of great beauty and variety, completely silicified, are found here and Crinoids in vast abundance.

In visiting this section a geologist may leave his hammer at home and come provided only with baskets or an express wagon which he would have no difficulty in filling with these ancient fossil remains. Specimens from this district have been shipped to many museums in Great Britain and United States. The Academy of Natural Science in Philadelphia was this year presented with a small collection of local specimens by the Chairman of the Section who thus advertises Ontario in an efficient way. When our city sees fit to establish a museum we have at our doors a rich field in which to secure a very varied collection suitable for studying the Paleontology of this district and which also may be used for exchanges.

After being Chairman of the Geological Section since its inception, excepting one year when Professor Andrus occupied it, Dr. Wolverton has now resigned in favor of Mr. Kirk, a capable and energetic member of our section.

The following reports will be placed in the hands of the Editor:

Roads and Road-making	Mr. Kirk.
The Galt Dolomites	Mr. Goodburne.
Methods of Concentrating Gold	Mr. J. G. Smith.
The Mastodon of Mount Brydges	Mr. J. G. Smith.

[The report on "Roads and Road-making" has already been published elsewhere.]

THE GALT DOLOMITES.

Limestone is perhaps one of the most abundant of all minerals, and the most widely distributed, quartz alone excepted. It appears in very many different forms, the ordinary one of limestone being best known, with marble as the most valuable, and these two show the extremes of the substance—one the original material and the other the metamorphic condition. Limestone is composed of carbonic acid, 44; lime, 56; but carbonate of iron or magnesia may take the place of a portion of the carbonate of lime. A very large amount of our limestones, however, are properly dolomites, which differ from the limestone in the process of deposition, and in chemical structure. Dolomite consists of carbonate of lime, 54.35; carbonate of magnesia, 45.65; these including a small portion of protoxide of iron (FeO) or magnesia. Dolomites are calcareous, and appear to have been simple chemical precipitates, and in some cases to have originated from the alteration of limestone rocks by magnesia salts.

Water containing free carbonic acid (derived from decaying vegetable matter) dissolves a portion of carbonate of lime, but the bicarbonate thus formed is easily decomposed, even by mere exposure to the atmosphere and a precipitation of calcareous matter takes place. In this manner the calcareous tufas of our swamps, (notably at Komoka), together with stalactites and stalagmites are produced, and similar processes on a large scale have deposited the strata in ancient seas and lakes. All limestones effervesce in acids; but the dolomites effervesce only feebly, unless the acid be heated. In some parts of Canada dolomites abound, but I think they are best shown along the Grand River from Elora to Galt, at Guelph on the Speed, and at some places in Dumfries. It is of several shades, commencing at the top with a yellow color, and becoming lighter and semi-crystalline about 50 feet lower: while about 100 feet from the top of the series the rock is almost white, and granular in texture—a most beautiful stone. Some thin beds are of a pale brown, still retaining the granular appearance. Between the semi-crystalline and granular textures there is, in some places, a thin band of rock which will powder in the fingers, and seems to be principally sulphate of magnesia. This, however, only appears in places. The dolomites yield excellent building stones, especially in the semi-crystalline series, while the granular layers are chiefly burned for building lime. In fact, the lime produced from these rocks is renowned for its excellence, becoming extremely hard with age, and it is doubtful if as fine a quality can be produced from any other class of limestone. The dolomites of the Guelph series are placed in the Onondaga Salt group of the Upper Silurian, which derives its name from Onondaga, near Syracuse, N. Y. In Canada the Onondaga deposits attain between 200 and 300 feet in thickness, and consist of thin-bedded dolomites, with greenish shales (chiefly argillaceous dolomites), and some masses of gypsum. The latter does not occur in regular beds, but in lenticular masses. The dolomites above the gypsum are generally arched and more or less fissured, while those on which the gypsum rests retain their horizontal position.

This Guelph formation is peculiar to Ontario, its rocks not having been traced beyond the limits of the province. It follows the western limits of the Niagara, and occurs as a bean-shaped mass, gradually thinning out westward toward Lake Huron, and eastward near Ancaster. Its greatest thickness is about 160 feet. Its principal exposures are at the places I have already mentioned. Along the Grand River it frequently presents vertical cliffs 80 feet high.

The fossils contained are small in variety, and most of them are identical with those belonging to the Niagara beds, as *Favosites gothlandica* and *Halysites catenulatus*, but others appear to be confined to this formation. As a general rule the fossils are somewhat obscure, and for the most part not very abundant. The most characteristic fossil, and one peculiar to this formation is the *Megalomus Canadensis*, usually found in the form of internal casts, and I will confine my attention to this fossil.

The *Megalomus* belongs to the Lamellibranchiata, or conchifera order, which are marine or fresh-water animals of the acephalus (headless) type. In the adult condition they have laminated gills or branchiæ for breathing purposes, and they secrete a bivalve external shell. The two valves are nearly always of equal size, but always more or less inequilateral. (A line drawn straight through the middle of an equilateral shell, divides it into two equal parts.) These mollusks are exceedingly abundant in the fossil state, though not so numerous as the brachiopods in older rocks. The existing species, both marine and fresh-water, number about 3,000, but about double that number of fossil forms have been found, which belong to many successive periods, and it is very probable this is only a very small portion of the Lamellibranchiate fauna of the past.

In their classification these mollusks fall into two leading sections and four groups;—

1. Asiphonida.

(a) Pleuroconcha.

(b) Orthoconcha.

2. Siphonida.

(a) Integro-Pallialia.

(b) Sinu-Pallialia.

The animals of the first section are without the respiratory tubes possessed by the Siphonida, and it is with this first section that we have to do.

The first group, Pleuroconcha, rest in their natural position with one valve *below* and the other *above*. They have but one large muscular impression in the centre of each valve, which forms a shallow pit, occupied by the muscle which keeps the valves closed. An example is the oyster and *Ambonychia radiata* of the Hudson River Group, Lower Silurian.

The second group, or Orthoconcha, are without siphonal tubes, but their valves are *right* and *left*, instead of upper and under, as regards its normal position, and the muscular impressions are two in each valve. The most remarkable of this genus is the *Megalomus Canadensis*, of Hall, which occurs in great numbers in the Guelph formation, principally in the form of internal casts, very few specimens showing the original shell.

The *Meg. compressus* of Nicholson, is allied to the *M. Canadensis*. It is smaller and more compressed; the umbones are more prominent, and the pallial line more distinct. Other fossils include many varieties of the *Murchisonia*, and these examples on the table are *M. Loganii*.

All these specimens are, however, internal casts only, very few having been found presenting the outer shells, and in the case of *Megalomus*, scarcely anything is known of its outward appearance. The filtration of water and the presence of carbonic acid in the dolomite have destroyed the organic matter of the shell, and left the cast of the interior. There is a great quantity of water in these rocks, saturating the stone heavily in the lower portions, which, when freshly quarried, is quite soft, becoming very hard on losing a portion of the water on contact with the atmosphere. Some of the quarries contain few fossils, others are full of them, and while one quarry may produce good specimens, the majority from others are of scarcely any use for cabinet purposes. Some fossils are also found in the gravels, but are very badly worn.

J. L. GOODBURN.

METHODS OF CONCENTRATING GOLD.

There are two methods of concentrating gold—by means purely mechanical and by chemicals. For the efficient separation by the former process innumerable appliances have been invented whose fundamental principle is in nearly every case based on the great specific gravity of gold.

For separating low grade gold ores an interesting appliance has recently come into general use in Western America. It consists of an endless rough-flanged belt passing over two pulleys, one slightly lower than the other, thus giving the upper surface of the belt. Near the lower wheel the pulverized ore is deposited and is carried upward by the revolving belt which meets a stream of cold water. This carries off the quartz, leaving the gold adhering to the rough belt whence it is later deposited in settlers.

Cyaniding and Chlorination have of late received much attention from mining men. The former particularly is made use of in a great majority of up-to-date mills.

The ore is crushed to a pulp before cyaniding and thrown into cyanide vats, after which a solution of cyanide of potassium is added to dissolve the finer particles of gold. The solution is drained off into "zinc" tanks filled with zinc clippings, where the zinc displaces the gold and the metal is deposited with the zinc slimes whence it is easily recovered by retorting.

In chlorination it is not necessary to crush the ore so fine. It is also roasted before being passed to chlorination vats to break up all sulphides. After the barrel is charged with the required amount of chloride of lime and sulphuric acid it is revolved slowly from three to eight hours, when the gold solution is drawn off through a filter into lead-lined settling tanks. From this the gold may be obtained by SO_2 , H_2S or by the charcoal method.

The cyaniding process, while it will not save more gold than will chlorination, possesses the advantage of saving from 70 to 80 per cent. of the silver values in an ore as well and hence is in more general use.

J. G. SMITH.

THE MASTODON OF MOUNT BRYDGES.

During the summer there was found on the estate of Mr. Duncan Forbes of Mount Brydges the jaw of a Mastodon. The find occurred several feet below the surface in a peat bog.

The jaw weighs 54 lbs., and is 30 inches long by 24 inches wide, by 18 inches high. It differs from the jaws of living animals in its great massiveness—a section through it almost forming a circle. The exterior is black in color and of a hard dense structure, being apparently filled with infiltrated iron.

The jaw contains four teeth—two on either side—none in front. The row on either side is about three inches wide by ten inches long. The front teeth contain three rows of nipples and the rear four rows.

A loose tooth was found to weigh one pound and a half. The teeth exhibit a remarkable degree of preservation, as the enamel remains as it was when the animal died. The tops of the nipples are notched by wear, show the hard black dentine beneath. From their appearance the animal would seem to be herbivorous.

The front of the lower jaw shows a peculiar structure as though it had contained tusks or teeth during the animal's lifetime.

(The finders attempted to reach other parts but have been so far unsuccessful.)

J. G. SMITH.

REPORT FROM THE ENTOMOLOGICAL SOCIETY OF ONTARIO TO THE ROYAL SOCIETY OF CANADA.

THROUGH THE REV. C. J. S. BETHUNE, D.C.L., DELEGATE.

When a society has attained to mature age, like an individual it cannot be expected that its thirty-seventh year should be marked by any great crisis or any striking event. It is natural, therefore, that the representative of the Entomological Society of Ontario should be able to present to the Royal Society of Canada only a report of quiet work and steady progress since our meeting a year ago.

The thirty-seventh annual meeting was held in November last at London, the headquarters of the Society. The opening proceedings were rendered notable by the joint meeting which was held with the recently organized London Horticultural Society. It was held in the splendid new building of the Normal School and was attended by a large and appreciative audience, representing both the Societies and the general public as well. It was presided over by Prof. C. C. James, Deputy Minister of Agriculture for Ontario, who delivered an address on the value of Horticulture in its various aspects, its intellectual advantages and its attraction for persons of literary tastes. He was followed by Mr. W. E. Saunders, of London, who read a paper on "The planting, care and pruning of the trees in the parks and streets of the city," which is a matter of much importance in a place whose beauty and attractiveness largely depend upon the noble avenues of trees in the streets, and the parks secured to the public by a wise and rare forethought. Dr. Fletcher, Dominion Entomologist and Botanist, then gave an address, illustrated with beautiful lantern pictures, and showing how trees should be grown and treated and the admirable results that have been obtained at the Experimental Farms at Ottawa and in the North-west. He also took up the subject of insects and described a large number of the most destructive species and the remedies that may be most successfully employed against them.

The afternoon of the following day was chiefly taken up with a discussion on the San José scale in Ontario. Mr. G. E. Fisher, Provincial Inspector, who was present by direction of the Minister of Agriculture, gave a full account of the prevalence of this most pernicious insect in several localities, and of the experiments which had been undertaken in order to procure, if possible, a practical remedy. Whale oil soap and crude petroleum were the principal applications employed, and while the former was not entirely effective, the latter was regarded by many as too dangerous a remedy for general use. Dr. Fletcher, Prof. Webster and others took part in the discussion. The attack is believed by all to be a most serious one, and to require prompt and effective measures for its repression.

The 31st annual report of the Society to the Legislature of Ontario was presented at the opening of the last Session and published in February. It consists of 112 pages, illustrated with forty-six engravings in the text and a photogravue portrait of Mr. J. Alston Moffat, for many years past the devoted Curator and Librarian of the Society. The volume contains reports from the various officers and sections, and from the flourishing Branches at Montreal, Quebec and Toronto. There is appended also an account of the second annual meeting of the North-west (Canada) Entomological Society, which has its headquarters in Alberta.

During the winter and spring fortnightly meetings for the study of Entomology were held on Friday evenings, and alternately with them the Microscopical Section held its sessions: much serious work was done in both departments and great interest was shown by the members. The Geological Section met weekly on Tuesdays under the guidance of Dr. Woolverton, and the Ornithological Section once a month at the residence of Mr. W. E. Saunders, one of the most devoted and well-informed bird lovers in the Province of Ontario. The Botanical Section has been in abeyance for a time, but is now being revived with every prospect of success. From this brief account it will be seen how wide a range of country the Society's operations cover and how many departments of natural science are included in its work.

In the report to the Legislature there are published the papers read at the annual meeting, among which may be mentioned the Presidential address of the Rev. Dr. Fyles, who took for his subject the offices served by insects in the promotion of the fertilization and improvement of plants. He gave an interesting and instructive account of a large number of plants and their attendant insects, and illustrated his remarks with a series of beautiful diagrams of the structure of numerous flowers, the work of his own hand.

Professor Lochhead, of the Ontario Agricultural College, read papers on "The systematic and economic study of forest insects in Ontario," setting forth the necessity of endeavouring to diminish the ravages of insects in addition to the work of protection against fire already undertaken by the Provincial Government: "The silk worm industry in Ontario," which has been begun on a small scale in the County of Essex but which the Professor contends cannot be made a lucrative occupation in this country; "The present status of the San José scale in Ontario;" "Nature-study lessons on the squash bug," intended for the use of school teachers; and an account of the "Insects of the season of 1900," which had proved especially injurious in the south-western peninsula of Ontario.

Mr. J. Alston Moffat contributed papers on "Anosia Archippus yet again," in which he discussed the various theories set forth regarding the migrations of this remarkable butterfly: "Parasites in the eggs of *Chrysopa*;" and "Notes on the season of 1900," enumerating some interesting occurrences, among which may be mentioned the capture in London of specimens of the curious Myriapod, *Cermatia forceps*, a southern creature which has been gradually working its way to the north.

Professor F. M. Webster, of Ohio, one of our honorary members who takes an active interest in the Society and attends its annual meetings, read papers of much practical value on "Results of experiments in protecting apples from the Codling moth," referring especially to

the injury wrought by the second brood ; "Results of some applications of crude Petroleum to orchard trees," setting forth the danger of its use and the necessity for a much larger series of experiments before it can be recommended as an insecticide to the ordinary fruit grower ; "Two Longicorn Beetles affecting growing nursery stock," viz: *Superda vestita* and *Oberea bimaculata*, which, though very familiar insects, have not been suspected of making attacks of this kind ; and "Observations on several species of Dermestidae," a family of beetles well-known for their habits of feeding on museum specimens and many household articles, but not hitherto recognized as phytophagous also.

Dr. James Fletcher, Dominion Entomologist and Botanist, gave a very full account of the Injurious insects in Ontario during 1900," and described the attacks on cereals, fodder crops, roots and vegetables, and fruits, many of which were of a very serious character. Mr. Arthur Gibson, assistant Entomologist at the Central Experimental Farm, described the methods which he had found most successful for "The breeding of Lepidoptera and inflation of larvae," illustrating the latter subject with some very beautiful specimens that he had prepared.

Reports on "Insects of the Year" were furnished by four of the Directors, Messrs. J. D. Evans, Trenton ; D. G. Cox, Toronto ; James Johnston, Bartonville ; and R. W. Rennie, London. The performance of this duty by these officers of the Society is of much importance as it brings together information regarding the chief insect attacks of the year in the various sections of the Province.

The Rev. Dr. Fyles contributed a descriptive paper on "The Dragon-flies of the Province of Quebec," and short papers were read by Mr. J. Dearness on "A parasite of the San José scale ;" Mr. C. W. Nash, "Notes on *Danais archippus* at Toronto ;" and Mr. P. B. Gregson on "Curious habits of the larvae of *Dermestes tulpinus*." The last named gentleman also furnished an account of the proceedings at the annual meeting of the North-West (Canada) Entomological Society.

The volume also contains a synopsis of the most important papers read at the meeting of the Association of Economic Entomologists, which are of great interest and much practical value.

The funds of the Society are shown by the Treasurer's statement to be in a satisfactory condition. The Librarian reports valuable additions of books and specimens, the number of the former on the shelves being almost 1700. The membership of the branches at Montreal, Quebec, and Toronto has steadily increased, and that of the whole Society grows from year to year. All interested in its welfare have much reason to be pleased with its continued success, and the valuable scientific and practical work which is being performed by its members.

The Annual Report, whose contents have just been described, records the practical observations and work of the Society ; for the scientific and systematic department reference must be made to the monthly magazine, "The Canadian Entomologist," the thirty-third annual volume of which is now being published. The volume for 1900 consists of 387 pages, and is illustrated with seven full-page plates and thirty-three figures from original drawings. The contributors number sixty four, and represent Canada, the United States, Mexico, Brazil, Great Britain, Germany, Switzerland and South Africa. As there are upwards of a hundred articles, besides short notices and book reviews, it would occupy too much space to mention the subject of each. They may, however, be grouped as follows :

Papers on Classification : North American Yponomeutidae and Tineidae, by Dr. H. G. Dyar ; the Wasps of the Super-family Vespoidea, and changes in generic names of Hymenoptera, by W. H. Ashmead ; the Genus *Orchelimum*, by Jerome McNeill ; the Genus *Catocala*, by Prof. G. H. French ; Notes on *Idiocerus* (Jassidae), by C. F. Baker ; the North American species of *Choreutis* and its allies, by Prof. C. H. Fernald ; New Mexico Bees of the Genus *Ceelixys*, by Prof. T. D. A. Cockerell ; Colorado Bees, by E. S. G. Titus ; some species of *Acronycta* in the British Museum, by Prof. J. B. Smith ; the Types of Noctuid Genera and a series of papers

on the Classification of Butterflies, by Prof. A. R. Grote ; some Genera of Mites, by N. Banks, and the Bibliography of Coccidæ, by G. B. King.

New genera, species and varieties have been described in the Lepidoptera by the late Rev. G. D. Hulst, Dr. Wm. Barnes, Rev. Dr. Fyles, G. M. Dodge, Miss Murtfeldt, W. Beutenmuller, Prof. J. B. Smith, Prof. C. H. Fernald and G. A. Ehrman ; in the Hymenoptera, by Prof. T. D. A. Cockerell, C. Robertson, W. H. Ashmead, Dr. L. O. Howard and A. D. MacGillivray ; in the Diptera by D. W. Coquillett, C. W. Johnson, A. L. Melander, J. S. Hine and Prof. G. H. French ; in the Orthoptera by Dr. S. H. Scudder ; in the Hemiptera (Homoptera) by J. L. Handcock, C. F. Baker, E. D. Ball, Prof. H. Osborn, Adolph Hempel, Prof. T. D. A. Cockerell, Prof. J. D. Tinsley, E. M. Ehrhorn, G. B. King and E. E. Bogue ; in the Hemiptera (Heteroptera) by A. N. Caudell, and in the Arachnida by N. Banks. Twenty-seven new genera are described and 213 new species and varieties.

Interesting and valuable life-histories of various insects are given by Dr. J. Fletcher, A. Gibson, Dr. H. G. Dyar, H. Bird, J. O. Martin, E. D. Sanderson and Dr. L. O. Howard. Papers on collecting and other observations of insects are given by W. Knaus, E. F. Heath, J. A. Moffat, Rev. Dr. Fyles, H. H. Lyman, J. G. Needham and A. J. Snyder.

In economic Entomology there are important papers by C. P. Lounsbury on Insect Bites and their effects ; T. Pergande on a Plant-louse injurious to Violets ; Prof. F. M. Webster on the Purslane Saw-fly, *Harpalus caliginosus* as a Strawberry Pest and the Diptera found in wheat fields ; Prof. W. G. Johnson on the Destructive Pea Aphis, and Prof. G. H. French on a Fly causing Epilepsy.

In addition to the foregoing publications, a General Index to the thirty Annual Reports of the Society (1870 to 1899) has been prepared by the editor, Rev. Dr. Bethune, and published by the Ontario Department of Agriculture. It is very full and complete and will prove of much value to all who have occasion to refer to these volumes.

INJURIOUS INSECTS OF THE SEASON OF 1901.

BY PROF. W. LOCHHEAD, ONTARIO AGRICULTURAL COLLEGE, GUELPH.
AFFECTING FARM CROPS.

In the south-west portion of the Province the wheat crop suffered severely from the attacks of the Hessian fly. In several counties the yield per acre was very much reduced, notwithstanding the plowing under of a large area both in the fall and spring.

So urgent was the demand for more information regarding the life-history and habits of the pest, that a bulletin was published by the Department of Agriculture in August, and distributed freely throughout the infested areas. This bulletin emphasized the great need for co-operation among the farmers themselves, if they ever hoped to cope with the fly. Late sowing, good preparation of the land to be sown to wheat, and trap-strips, will be found effective if all the fields are treated alike ; but if some fields are sown early and become infested with the fly in the fall, there is no way of preventing the flies which emerge from these fields in May from migrating to uninfested fields and damaging them before harvest.

ORCHARD INSECTS.

As in previous years, the codling worm (Fig. 17). was the most destructive orchard insect, especially in the sections where the insect is double-brooded. A word of warning may be given here, lest owners of orchards become lax in the matter of spraying with Paris green immediately after blossoming, while attempting to entrap the second brood by bandages. We can never afford to give up spraying with Bordeaux and Paris green, for by doing so the codling worm and fungus diseases are kept in check. The frequent rains about the blossoming period interfered with the spraying operations, and when the applications were not renewed, the effect of the Paris green was very slight indeed.

In connection with the bandages, I find that sacking is the best material for bandages. It is the cheapest as well as the most easily applied and removed. Success with bandages requires careful attention to them every two weeks. They should be removed from the trees and examined for cocoons, then replaced. It is next to impossible to examine the burlaps thoroughly without removing them from the tree.

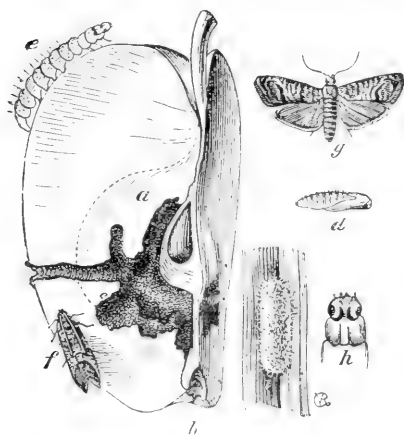


Fig. 17. Codling moth. Quarter of an apple shewing the injury caused by the worm (a); the moth (f and g); chrysalis (d); larva (e), its head and first segment (h); cocoon (i). Riley.

The Haseltine trap lanterns were kept burning nearly every night from June 7th to September 7th, to ascertain the kinds of insects that are attracted to such lights. The results are somewhat startling on account of the capture of a large percentage of decidedly beneficial insects. For example, 30 per cent. of all the forms taken were *Ichneumon* flies; nearly 2 per cent. were Lady beetles and Ground beetles; 2½ per cent. were Dung beetles; 3 per cent. were Mosquitoes and Crane-flies; 1 per cent. Fireflies. Sixty per cent. of the whole number taken were composed of injurious forms, such as May beetles, Squash bugs, Cabbage worms, Cucumber beetles and moths. The strangest thing in connection with the trap lantern experiments was the complete absence of Codling moths. It is evident that as a means of capturing

Codling moths, these trap-lanterns are a decided failure.

THE POTATO STALK-BORER.—(*Trichobaris 3-notata*.)

Under date of Sept. 14th, Mr. J. A. Auld, M.P.P. for South Essex, wrote me regarding a serious insect attack of the potato vines on Pelee Island, and sent samples of the dying stalks. These branches were widely tunnelled from the base to near the tip. The potato crop will be a partial failure this year and the loss will be serious. In 1900, Pelee Island shipped 30,000 bushels of potatoes, but in 1901, there will be few bushels to spare.

The cause of the trouble is a small snout-weevil (Fig. 18, c) which deposits its egg in the stalk some time in late May or early June. A small white grub (Fig. 18, a) hatches from the egg, and begins at once to tunnel the centre out of the stalk. It is then nearly half an inch in length, with whitish body and brown head, and legless. It constructs within the tunnel a rude cocoon out of fibres or clay within which it changes to a pupa, (Fig. 18, b.) The pupal stage probably does not last longer than two weeks, for in the same stalk I found grubs, pupæ and adults. The adult beetle remains in the vines all winter according to Dr. J. B. Smith.

The only outward appearance of the presence of a pest is the premature blackening of the stalks, and consequent wilting; but when the stalks were handled, and pressure applied, they collapsed more readily than would normal plants.



FIG. 18.—Potato Stalk-borer; a, grub; b, pupa; c, beetle.

Although this Borer is well-known in many parts of the Western States, in Iowa, and Nebraska, for example, this is the first record of its presence in Ontario as a destructive potato insect. Fortunately remedial treatment is both simple and practical, from the fact that the adult remains in the vines over winter. If the

vines are gathered and burned as soon as possible after the potato harvest, the majority of the adults will be destroyed.

ASPARAGUS BEETLES.

Attention was called in my Notes of the last two seasons to the progress of the two species of Asparagus beetles westward from the Niagara river. In 1899 they had reached St. Catharines; in 1900 nearly to Hamilton. This year they were present in the Asparagus beds at the O. A. C. farm in considerable numbers. I have not heard of their appearance in places west of Guelph, but undoubtedly they are *Westward, Ho!* and are bound to join hands with their brothers in Michigan.

At the College the Twelve-spotted species (*Crioceris 12-punctatus*, fig. 19) was by far the



Fig. 19. *Crioceris*
12-punctatus.



Fig. 20. *Crioceris*
asparagi: beetle,
grub, and eggs
on plant.

more abundant, and it is apparently leading the other species (*C. asparagi*, fig. 20) in its march through Ontario.

About St. Catharines the beetles did much damage. They appeared in such numbers on the tender shoots and disfigured them so much that the shoots were unmarketable. They seemed to gnaw the epidermis as the shoot was peeping above the ground, before it was ready to cut for market.

It is probable that when greater attention is given to the destruction of the beetles after the spring cutting is over, fewer beetles will hibernate and give trouble in early spring.

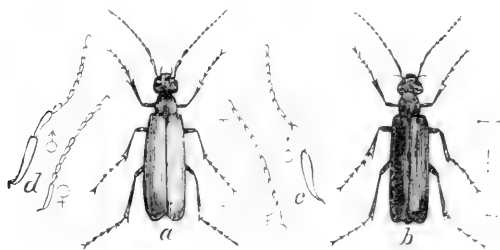


Fig. 21. Blister Beetles—*a*, *Epicauta cinerea*;
b, *E. Pennsylvanica*.



Fig. 22. *Epicauta*
vittata.

BLISTER BEETLES.

These insects were numerous the past season, and in some sections "alarm" was beginning to be felt." Three species were common, viz., *Epicauta Pennsylvanica*, *Epicauta cinerea*,

and *E. vittata*. Of these *Epicauta vittata* was perhaps most commonly seen. All are rather soft-bodied insects, and may be distinguished by their color. *E. Pennsylvanica* (fig. 21 b) is uniformly black; *E. cinerea* (fig. 21 a) is blackish with grey streaks along the margins of wing covers and middle of thorax; and *E. vittata* (fig. 22) yellowish with black stripes. The striped species was present in large numbers on beet crops; the ash-colored species on vetch, horse beans, lucerne, and the black blister beetle on Golden Rod.

When the life-history of blister beetles is studied it is found that their larvæ prey upon grasshoppers, and hence are beneficial. A question, therefore, arises: "Should we destroy the beetles and try to lessen their numbers?" It must be understood that the more adults we kill the fewer larvæ will develop to destroy the egg-pods of grasshoppers, and the greater the number of grasshoppers appearing the following season. When these factors are borne in mind there is good reason for allowing the adult beetles to feed unmolested. They never remain long enough to do much serious injury. They usually appear in large numbers for a week or ten days, but they disappear as suddenly. It is a matter of observation that blister beetles are more numerous than usual the season following one when grasshoppers were very abundant.

Before the advent of the Colorado Potato Beetle these blister beetles were the "potato beetles." In many districts in the northern part of the province they are still the "potato beetles."

PLANT LICE.

Plant lice, or Aphids, (Fig. 23), were more abundant than usual this past season. The early spring with its moist, cloudy weather was strongly in favor of their rapid development; and among the more common forms that did considerable mischief were the Cherry Aphis (*Myzus cerasi*), Apple Aphis (*Aphis mali*), Plum Aphis (*Aphis prunicola*), Currant Aphis (*Myzus ribis*), the Rose Aphis, and the Grain Aphis. As Aphids are sucking insects, that take their nourishment in the form of plant juices through a slender tube, arsenical poisons on the plants have no effect. Frequently the presence of a few plant lice in the early part of the season is altogether neglected, when a little trouble at that time would practically exterminate them. Many persons are unwilling to believe that from a few Aphids tens of thousands of them will develop before July. Huxley once computed that "the uninterrupted breeding of ten generations of plant-lice from a single mother would produce a mass of organic matter equivalent to that of 500 million of human beings." As Dr. Howard remarks, this great productiveness is due more to the early age at which the Aphids begin to reproduce, rather than to any extreme prolificacy.

The majority of the generations or broods produced during the summer are wingless, but at intervals winged broods occur. This is very probably a provision for the distribution of the species. The last brood of the season is a winged one, composed of both males and females. Soon after mating the males die, while the females perish after the deposition of the eggs.

Plant-lice have possibly more enemies, which feed upon them, than most other injurious insects. These enemies are Lady-birds, Braconids, Aphis lions, maggots of *Syrphus*-flies, and certain other dipterous maggots. All of these kill immense numbers of Aphids, and in some instances exterminate them, but in most cases extreme rapidity of development more than counterbalances great mortality.

THE CURRANT APHIS (*Myzus ribis*).

Although never a serious pest, this Aphis disfigures and renders unsightly the leaves of currants. Attention is here called to it on account of the many inquiries

regarding the purplish swellings or blister-like elevations on affected leaves, which make their appearance in May. In the concavities on the under surface will be found clustered large numbers of Aphids, both winged and unwinged, all busy sucking the juices from the leaf.

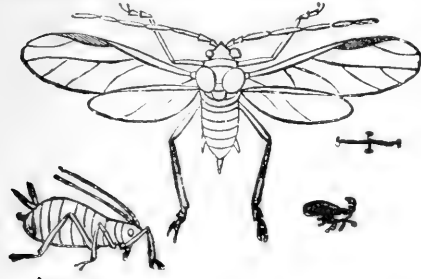


Fig. 23. Plant-lice (*Aphis*) winged and wingless (much enlarged).

It is seldom that these Aphids are troublesome after midsummer.

Prompt picking of affected leaves, or applications of Kerosene Emulsion, whale oil soap solution, or Gillett's Lye, are the best methods of dealing with Currant Aphids.

CHERRY APHIS (*Myzus cerasi*).

During June the cherry trees in many sections became badly infested with plant-lice (*Myzus cerasi*). The leaves of the large terminal twigs were chiefly affected. They became much distorted, and discolored by a fungus feeding on the honey-dew, and with excrement; and then became inrolled with the Aphids feeding within. The effects on the leaves are detrimental to the growth of the tree, inasmuch as much nourishment intended for the development of the tree is taken by the plant-lice within their own bodies.

These Aphids are shining black insects. They frequently multiply so very rapidly that the smaller leaf-stalks and twigs become completely covered with them. The leaves and branches near by become very sticky from the abundance of honey-dew excreted.

Enemies of the Cherry Aphid are usually present, and kill an astonishing number, sometimes almost ridding the trees.

The life-history of the Cherry Aphid is similar to that of other Aphids which appear on many cultivated plants. They winter over in the egg-stage; in early spring the eggs hatch; and a brood of females appear, which produces living young at a rapid rate on the Cherry up till July, when they disappear. Although not definitely proved, it is probable that the lice migrate to the roots of the Cherry, and to other plants. In autumn, a brood of winged males and females make their appearance. After mating, the females deposit eggs for the winter about the buds of the Cherry.

Treatment, to be effective, must begin early, before the Aphids roll the leaves around themselves; otherwise they are difficult to kill. Kerosene emulsion, tobacco solution and whale-oil soap solution are all good.

(10 lbs. of tobacco waste are thoroughly soaked in water; and the solution is made up to 40 or 50

gallons. Dr. Fletcher recommends the addition of 1 lb. of whale-oil soap to the barrel of

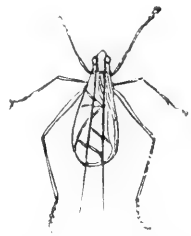


Fig. 24 Snowy Tree-Cricket, male.

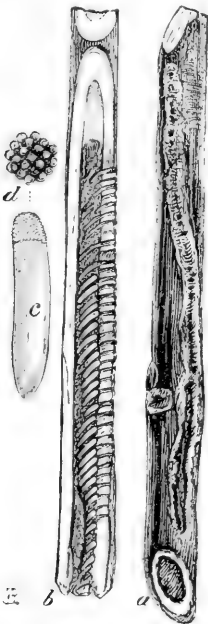


Fig. 26. Snowy Tree-Cricket, a twig showing punctures, b same split open, showing eggs in position, c egg magnified, d granulated top of egg. (Riley)

tobacco solution).



Fig. 25. Snowy Tree-Cricket, Female.

SOME BUSH-FRUIT INSECTS.

By bush-fruits I mean red raspberries, black raspberries, currants, and gooseberries.

Perhaps more inquiries were made regarding injuries done to bush-fruits than to any other horticultural crop. Fortunately under careful management and treatment most of the insects can be kept under control.

The Snowy-Tree Cricket (*Ecanthus niveus*). Figs. 24 and 25. Although the work of this insect is readily recognized, yet too many of our gardeners are unacquainted with it. The female in autumn deposits her elongated cylindrical eggs in punctures in rows (Fig. 26), which are nearly vertical on the erect canes. The result is a long, ragged wound, which interferes materially with the growth of the cane. The remedy is to cut out and burn the wounded portions before the eggs hatch in the spring.

The Raspberry Cane Maggot.—In June frequent complaints were made regarding a wilting of the tips of raspberry canes. The pith of the canes was burrowed from the tip downwards for a short distance, then the inner bark was girdled, producing a wilting of the tip. The portion of the stem burrowed is of smaller diameter than normal, and is of a dark blue color. The affected canes usually die, for the maggot continues to tunnel its way downward to the base.

The cause of the mischief is a two-winged fly belonging to the genus *Phorbia*. From observations made in 1891 by Dr. Fletcher, and in 1896 by Prof. Slingerland, it would appear that the girdling commences early in May, and the maggot reaches the base in June. In the case of the specimens sent from Hespeler on June 11th, the maggot had not then reached more than half way to the base.

The eggs are deposited in early spring at the base of the tip leaves. The insect winters over in the pupa stage at the base of the plant.

The remedy in this case also is to remove the wilting tips as soon as noticed, and burn them.

The Pale Brown Byturus.—During June the flowers and flowerbuds of raspberries suffered severely from the gnawing attacks of small, hairy, yellowish-brown beetles. The injured buds scarcely ever develop fruit for the reason that the stamens and pistils are destroyed.

Later in the season when the eggs have hatched, the grubs damage the nearly full-grown berries. When full-grown, the grub becomes a pupa in the earth, where it remains all winter.

The remedy for the *Byturus* is to spray with paris green and lime solution.

The Raspberry Cane Borer.—On July 1st, Mr. W. N. Hutt, B. S. A., of Southend, sent me specimens of red-raspberry canes which were punctured by this cane-borer. The tips of the young shoots were wilted, and drooping. The rows of punctures around the cane, and the hole between the rows in which the egg is laid were quite evident, as well as characteristic. The grub on hatching from the egg bores downward in the pith, and reaches the root by autumn. There it transforms into a pupa and rests all winter.

THE ROSE-CHAFER.

(*Macrodactylus subspinosus*).

Usually this beetle confines its attacks to roses and grape, and often does much injury to the blossoms. Last June, however, it began eating the half grown peaches in two large orchards near Niagara-on-the-Lake, and considerable alarm was created lest it should spread to neighbouring orchards. The alarm was occasioned by the presence of immense numbers of the Chafers, and by the knowledge that arsenical poisons were of little use in such an emergency. As many as eight or ten chafers were found feeding on a single peach, and but few peaches were left untouched.

It is probable that the most available remedy at the time is to jar the Chafers from the trees in early morning into receptacles, or on sheets where they may be killed. The operation should be repeated on several successive mornings until the danger is over.

The sudden appearance of the Chafers in immense numbers is accounted for by the habits of the larvæ, which feed on the roots of grasses in sandy locations. In the same locations the pupæ are formed, but when the adults emerge, usually all about the same time, they betake themselves to the most convenient orchard or vine-yard. A line of investigation lies open in this connection. If the feeding grounds of the larvæ were discovered and ploughed in spring, while the insects are in the pupal condition, many of them would be destroyed.

The life history is as follows: The female Chafer deposits her eggs in the ground in late June or early July. These hatch in a few weeks, and the grubs feed on the roots of grasses till October, when full-grown they descend still further beyond the reach of frost. In May, they become pupæ, and in June the adults emerge.

THE OAK-PRUNER (*Elaphidion villosum*).

The work of this beetle (Fig. 27) is so interesting that it deserves some mention here. Under date of July 30th, the Hon. Justice Osler, of Osgoode Hall, wrote me an accurate and interesting account of the work of this Borer in breaking off branches of Oak, as observed on some islands in the Georgian Bay, near Parry Sound. At a later date the same gentleman favored me with specimens of the work of the insect from which I was able to get the larvæ (Fig. 28). Mr. Osler writes: On a tree affected by it will be seen the ends of branches hanging down, and leaves brown and dead. Examination shows that they have been deeply sawn through, remaining attached by a bit of the bark. Opening the end of the drooping branch in July or August, a very lively Borer is found in the shape of a fat, whitish grub, who has closed up the passage at his rear by his saw-dust. He does not appear to work backward, towards the trunk of the tree. Near where his life work appears to have begun, which is at the junction of some leaf or smaller branch, are often seen one or two small, hard, semi-cylindrical cases, about the size and shape of the common 'Lady-bird,' empty, but probably the harbor in which the egg was laid which produced him."



Fig. 27.
The Oak-pruner.



Fig. 28. The
Oak-pruner larva



Fig. 29. The
Oak-pruner pupa

The habits of this beetle are described in greater detail by Dr. Saunders in "Insects Injurious to Fruit," pp. 31, 32; and by Dr. Packard in the "Fifth Report of the Entomological Commission," pp. 83-89. It is not only injurious to the oak but also to the beech, chestnut, birch, hickory, peach and apple. Dr. Saunders calls it "The Apple Tree Pruner."

Attention may be directed here to the wonderful instinct which the insect undoubtedly possesses. The female deposits an egg in an angle of a leaf stalk, near the tip of the twig. The grub, on hatching, feeds on the soft, pulpy pith, until it reaches the branch, when it gnaws the harder, woody tissues, and begins tunneling the branch to its base. Then the sawing process occurs. "This," Dr. Fitch says, "is a most nice and critical operation, requiring much skill and calculation, for the limb must not break and fall while he is in the act of gnawing it apart, or he will be crushed by being at the point where it bends and tears asunder, or will fall from the cavity where it breaks open and separates. To avoid such casualties, therefore, he must, after severing it, have time to withdraw himself back into his hole in the limb, and plug the opening behind him before the limb breaks and falls." With the eye of a trained woodman, he "cuts the limb asunder so far that he supposes it will break with the next wind which arises and withdraws himself into his burrow, and that he may not be stunned and drop therefrom, should the limb strike the earth with violence when it falls, he closes the opening behind him by inserting

therein a wad formed of elastic fibres of wood." Usually his sawing is so accurate that he has not long to wait before he falls with the limb. After the branch has fallen the grub continues to eat and grow. It changes to a pupa (Fig. 29) sometimes in the fall, but usually in the spring. The adults appear in June, the female to lay her eggs as already described.

MARCH FLIES (*Bibio*).

Under date of May 29th, a correspondent at Weston sent me three specimens of *Bibio*. He says:—"Yesterday our beds were infested by an immense quantity of flies,—eating Pansy buds, and also the flowers." At other dates also, reports have been received regarding the supposed damage to plants by these flies; but although I have invariably at the time asked for specimens actually seen injured by the flies, I have never received any. It is hardly likely that these flies injure the buds and blossoms, although the maggots are known to attack the roots of grasses. The usual food of the larvae, however, is decaying vegetable matter.

In the discussion which followed upon the reading of this paper Prof. Webster referred to the Hazeltine Moth-trap, which he denounced as a perfectly useless affair and recommended that the Canadian government should impose a duty of \$5.00 on everyone imported into this country in order to prevent its introduction, 40,000 had been sold in the United States this year and the owners expected to sell 50,000 next year. He had yet to learn that it had caught any codling moths, or at any rate more than a very few, though it professed to exterminate them in the orchard where it was placed.

The Potato Stalk-borer he had found destructive to tomatoes and egg-plant as well as potatoes, near Lake Erie. The 12-spotted asparagus beetle had not yet been found in Ohio, but was evidently spreading rapidly. For the Rose Chafer he could not advise poison, as no poison had been found to kill it, it would eat those in ordinary use and apparently thrive on them. It can however, be destroyed on fruit-trees by using a can with some coal-oil in it attached to the end of a pole and knocking off the beetles into it with a light rod; this can best be done early in the morning when they are not so active as in the heat of the day. It breeds in sandy soil which is not very dry, and forms its pupa there; the least disturbance of the soil by cultivation will kill it out.

Mr. Moffat presented an account of the death of a woman at St. Thomas which was supposed to have been caused by the bite of an insect. He had obtained the specimen from the doctor in attendance and exhibited it to the meeting. It proved to be the well-known ground beetle, *Galerita Janus*, Fabr., which is usually found under stones in moist places and is classed among beneficial insects. As this beetle was found in the patient's bed four days after she was taken ill, it seems incredible that it should have had any connection with the blood-poisoning, which began in the patient's face so many days before, and terminated fatally.

NOTES ON THE SEASON OF 1901.

BY J. ALSTON MOFFAT, LONDON.

After an unusually severe January, February and March a favorable opening of spring was anticipated, but in that we were disappointed in this locality. April was cold until near the close, when we had a few warm days, which had a marked effect on insect life, and brought forth *Hymenoptera* and *Diptera* in profusion, whilst the hibernated butterflies enjoyed the bright sunshine immensely; and the small blues came out in numbers. May was decidedly disappointing. For although it brought forward vegetation rapidly, it was quite too cool to pro-

mote the development of the larger forms of Lepidoptera, so that the lilac blooms passed without the appearance of sphinges and other moths that usually attend their attractive feast. June 1901 was reported to be the coldest June experienced in a great many years. But on the 24th it took a turn, and a hot term followed, which lasted for five weeks without a break, with such extreme heat as will have impressed itself on the memory of those who passed through it for the rest of their lives. Such peculiar weather conditions had the effect of disarranging the usual appearing of common forms of insects. Some came out sooner than usual, others were late in showing themselves, and others failed to put in an appearance at all, whilst a few kinds were extremely abundant.

Never before have I seen *Aphides* so prevalent, they were out in all their kinds and colors, on root and branch, and in such masses. But to make amends the lady bird larvæ were noticeably numerous, and no doubt this was the cause of their greatly reduced numbers at the end of the season. The potato beetle was late in appearing, but was in more than usual abundance later on. The imported cabbage butterfly remained scarce until the late summer broods

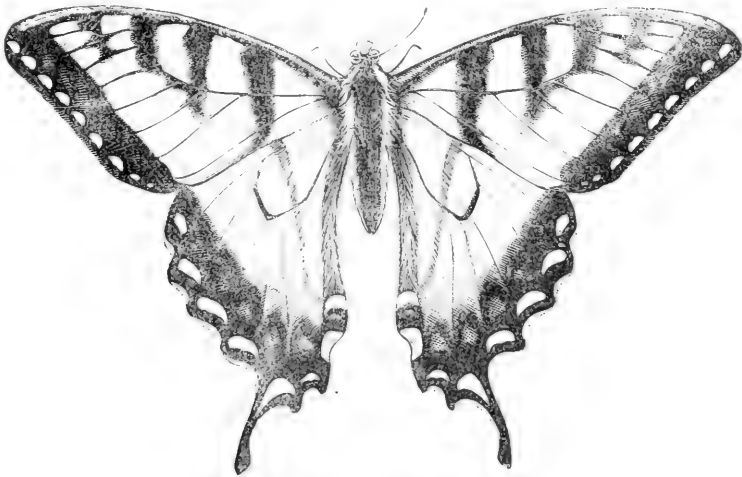


Fig. 30 —The Yellow Swallow-tailed Butterfly (*Papilio turnus*)

appeared. *Papilio turnus* (Fig. 30), the yellow swallow-tailed butterfly, appeared early and stayed late. It was seen about the middle of May, and was not wholly absent in the middle of August. A long continued period on the wing, which I have often seen but cannot account for, and which seems to require some explanation. Neither the Thistle butterfly, the Hunter or the Red Admiral were much in evidence during the season here. The *Argynnis* in their various species were moderately plentiful. About the middle of August I received an intimation from Mr. J. D. Evans, of Trenton, that he had taken a specimen of *Papilio Cresphontes* there in fair condition, the furthest east it has yet been reported in Canada. About the same time Dr. Bethune observed one in London; and on the 25th I picked a damaged specimen off a flower with my fingers, the first of the kind I have seen abroad in several years. It was also reported to me as having been taken in other places in this neighborhood. So that southern butterfly has not yet succeeded in establishing itself as a permanent resident in this locality; it is even now but a periodical visitor.

Anosia Archippus (Fig. 31) was late in arriving, and remained scarce through the season. The first one I saw was on the 12th of June, in a very worn and faded condition. Then I saw another on the 15th, so bright and fresh that it might have passed for a newly emerged specimen. I received from Mr. Henry Bird, Rye, N.Y., a letter dated 15th May, 1901, in which he

remarked that he had seen an *Archippus* butterfly before that. As scarcely any of the observations published upon the movements of *Archippus* have come from New York State, I take the liberty of giving publicity to the remarks on the subject which he so kindly favored me with, never suspecting that they would go into print. But as they are so interesting in themselves besides assisting in illuminating a page of *Archippus* history, I take pleasure in producing them for the benefit and enjoyment of others.

"My observations, Entomologically, are very meagre so far. One *Archippus* butterfly was noted. This one was sailing along rapidly, a couple of feet from the ground, with an eye open for the first appearance of the milk weed no doubt, and was skimming northward eight or nine

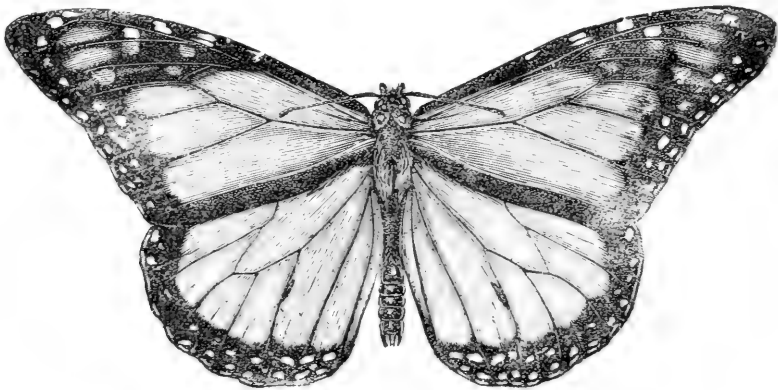


Fig. 31.—The *Archippus* Butterfly.

miles an hour. It was a worn specimen, and though its progress through the air was much faster, its angling flight searching for milkweed would bring initial progress at about this figure. As I was following in my buggy and had the example in sight some ten minutes I could judge pretty well of its progress.

"But in crossing water much better time is made, of course, and I have made some observations here. I have explained how my home is situated on the shore of Long Island Sound, a long, narrow body of salt water, eight miles wide at this part, and 120 miles long. Long Island, a great sandbank of glacial days, lies the other side of this Sound, and divides it from the Atlantic ocean. Although the warm Gulf Stream swerves off from our coast much further south, still there is some effect on the Long Island fauna, and it affords many features belonging to a more southern latitude. So naturally we may look for southern migrants from that quarter, and this is amply borne out in actual observations. In my younger days, when the "struggle for existence," etc., was not so pressing, I used to find time for a day's fishing now and then, and in a row-boat would anchor a half mile out from the shore on some submerged reef, in about thirty feet of water, and catch the rock-bass in which the Sound abounds. Passing a day in this manner, one has time between bites—both of the bass and of luncheon—to notice what is going on overhead. And one is sure to be struck with the number of butterflies constantly coming from the Island to the main shore. We might expect the supply to be largest on the main land, and that emigration would be going the other way, yet it is invariably as first stated. By far the largest number seen will be *Archippus*, next *Papilio*s and *Colias Philodice*. *Archippus* fly at the highest elevation, but begin to drop on nearing shore, so on passing the fishing grounds are sometimes within reach. I have watched them so many times, and their numbers and flight are surprisingly regular. The species seems on the wing continually during the last half of the season, and their flight over the Sound waters seems most methodi-

But in this case—they are going north, mind—they fly singly. To a watching fisherman, as an example gets abreast of his boat, he may look out across the water and see another coming in about the same track, and if he strains his eyes a bit, still another, just a speck, can generally be made out, well up in the blue. And so it goes on through the warmer hours of the day. *Archippus* or *Turnus* do not mind the flight at all, but poor little *Philodice* or *P. rapæ* are glad indeed to settle on the first bit of herbage or flower they can reach. So the number which cross this body of water is large, and one rarely sees an example in the water.

“The most striking emigration in point of numbers that I recall as coming from Long Island was that little white and black speckled geometer—*Catena Catenaria*, which came over in myriads during one whole day, and gave our landscape quite a snow-squally effect. But these feeble flyers were dependent on a stiff breeze for making the trip at all, and then about half of them fell in the water. So much for emigration.”

In reference to the point which Mr. Bird has called my attention to: that those separate specimens of *Archippus* were all flying north when crossing Long Island Sound, I would remark, that in doing so at that time they are as certainly obeying their natural inclination to travel, and that for a purpose, as when they go south in crowds later in the season. For, if those single individuals could have been traced to their destination it would have been found that they were making for a general gathering place, where they were forming one of those immense swarms which have attracted so much attention, preparatory to their leaving in a flock to go south together. So the fact of their going north at that time does not conflict with their going south later on, as they have to gather from all directions, at what appears like a preconcerted place of meeting. Constrained by an internal monition, or drawn by some invisible magnetic influence, they gather from every point of the compass to one particular place, as unerringly as the needle turns to the pole, and there await the gathering of the crowd, to start out at the proper time on their long southward journey. As they do not, so it seems that they cannot at that time go singly; and the belated stragglers that are left behind the migrating flocks in this latitude, assuredly perish.

Numbers of *Archippus* butterflies were to be seen flitting about the streets of London, during the first week of September, and occasionally stopping to feed at moist places. The last one observed on the wing was on the 27th of the month.

About the first of September Mr. Balkwill brought in some beetles that had been found feeding upon green corn inside the husks, with a sample of the injured corn. The beetle proved to be *Euphoria inda*, Linn. (Fig 32), a well-known injurious flower beetle, also bearing an unsavory reputation for spoiling soft ripe fruits, such as pears, plums and peaches. It was the first time my attention had been drawn to its attacking corn in this country, although it is known as an old offender in that direction in the south-western States. From the appearance of the corn that was presented, it is evident that this beetle is quite capable of doing a vast amount of



Fig 32. damage in a cornfield where they are numerous; which, fortunately for Canada, they have not, so far, been found to be. Their ability and method of reaching the corn inside the husks has been a subject of considerable discussion in the localities where their injury has been greatest, some claiming that it is only after the husk has been torn open by bird or beast that the beetles can reach the grain. But from the wonderful strength with which they are endowed, which every one who has handled them must have noticed, one could readily believe that they would have no difficulty whatever in pushing their way inside the husk by the silk end. And, seeing that they bury themselves in the ground to pass the winter, they might easily dig through the husks in order to obtain the succulent morsels within, in the absence of other things within their reach whereon to satisfy their cravings.

THE PAINTED LADY BUTTERFLY,

(Pyrameis Cardui, L.)

BY JAMES FLETCHER, OTTAWA.

The irregularity in the appearance of the Painted Lady Butterfly has frequently been noticed by entomologists. For several years the species will be scarce or almost unseen in a locality, then suddenly large numbers will appear, winging their bold and fearless flight in every direction, and will produce what, among collectors, has been called a "Painted Lady year." This insect is one of the very few which are identical with their European representatives, and this one has a very wide distribution, being found, with very slight variations, almost all over the Northern hemisphere. The sudden appearance of a swarm early in the season is due to the migratory habit of this strong-winged fly. There are two broods in the season, as with most of the Vanesians. When I was a boy in England, an annual excursion eagerly looked forward to was a visit made to some caves at Upnor, on the River Medway, a few miles from Rochester. Late in November or December, armed with an unnecessarily large supply of tallow candles and matches, a select party of youthful aurelians used to hie to these caves for the unusual pleasure of catching butterflies in winter. Having reached the caves, we had to enter by crawling over a mound which almost filled the mouth of the cave, when a comparatively large chamber was found with three or four passages running off in different directions. Here the candles were lighted. In small pockets along the passages, hibernating specimens could always be found of the Peacock Butterfly, *Vanessa Io*, and the small Tortoise-shell (*Vanessa urticae*) of about the same size, and with very similar habits to our Canadian (*V. Milbertii*), to which indeed, unless the two are put side by side and compared, it bears a somewhat close superficial resemblance. Occasionally in these forays, we were lucky enough to find a few Painted Ladies. All the butterflies were hanging from the upper surface of the passages or crevices, with their wings closely shut, and with the antennae drawn back between the wings. The Peacocks and small Tortoise-shells were easily seen, owing to their dark colour, but the beautiful mottled under-sides of the Painted Ladies made them rather hard to distinguish in the flickering candle light. This butterfly cave was supposed to be a very secret hunting ground, and all who visited it were in honour bound only to take such specimens as were perfect, and only just so many as they actually required.

The Vanesians hibernate in the same way in this country, not only in caves but in hollow trees and in buildings. *Grapta j-album* and *Vanessa Antiopa* I have frequently hibernated artificially in a rather dark unused attic, or in a wooden box behind a fence out of doors. This habit of hibernating in the perfect state is accountable for most of the occasional notices in newspapers of the appearance of butterflies in warm days during the winter.

Last spring the Painted Lady was not uncommon at Ottawa in early June, but was not noticed with *Vanessa Antiopa*, *Grapta j-album* and *Grapta Progne*, sipping maple and birch sap in May. The butterflies came suddenly in June; all through the month, until the new brood appeared about the middle of July, they were a conspicuous feature of the woodland, along roads, in gardens, and in clover fields. The flight of the Painted Lady is quick and irregular; it seldom stays long in the same place, flying hap-hazard from flower to flower in a most unbusiness-like manner, always ready for a gambol with another of its kind, dashing close past or circling round and round a new comer. It flies, too, later in the evening than any butterfly I have observed, and at that time of the day seems to delight to settle on buildings. Two or three specimens will sometimes choose the same tower of observation, over and around which they will chase each other apparently with great delight, stopping occasionally in their wild flight, and soaring upwards opposite to each other like two boys, sparring for several seconds at a time. Not only will these intrepid insects dash at other butterflies, but they seem particularly

fond of worrying the large locusts—*Dissosteira Carolina* and the clicking *Circotettix verruculatus*—when these are flying by or are hovering in the air over their mates. These clumsy flyers, surprised and indignant at the unexpected onslaught, make a few spasmodic efforts to evade their nimble persecutors, but soon settle down with rustling wings to the ground.

The Painted Lady seems particularly to enjoy flying round and round the tops of mountains. Collecting on the bare black summits of mountains, where there is little cover, is always a matter of some difficulty, but this is much increased by these frolicsome, restless, fickle, "ladies." After carefully stalking, perhaps creeping on all fours, over hot rough rocks, towards a much desired *Argynnis*, or *Chionobas*, which, although very much on the alert, has at last settled for a few moments, how often are the collector's hopes dashed to the ground by seeing one of these restless sentinels rush in and stir up his quarry, driving it off over the edge of the mountain, not to return again for a long time. This, however, is far from being the case with the unwelcome tormentor, which is back again within a few moments, sunning its wings within a few feet of him, but just beyond the reach of vengeance, and ready for the next effort. *Vanessa Californica*, a cousin of the Painted Lady, was not uncommon during the past summer in the Rocky Mountains and was also found to have the same, in the eyes of the collector, most objectionable habit.

In Dr. Scudder's splendid work, the "Butterflies of the Eastern United States and Canada," a most interesting account is given of the Painted Lady and its habits. Quoting from Meyer-Dur, he says, "Its wildly timorous behaviour is quite striking; it is uncommonly audacious; swift and savage it dashes irregularly about, scarcely observing the pursuer; heedless of the net it returns directly to the place it has left, and sits with horizontally opened wings on the dry earth or spots of sand. It is a nimble, lively, youthful, untamed, petulant insect which shows in its behaviour no resemblance to its proud but circumspect neighbour *Atalanta*."

Dr. Scudder says himself of this butterfly: "It frequently alights on stone walls heated by the sun, and is greatly attracted by flowers, particularly by thistles and the other plants upon which the caterpillar feeds; here it may readily be taken; not so in other spots, for although very fearless, and even impudent, it is exceedingly wary, dashing off headlong at the slightest alarm."

In 1884 a remarkable occurrence of the Painted Lady Butterfly was noted, and the fact was recorded by Dr. Saunders in his presidential address to the Society (Can. Ent., xvi., p. 211) that it was so numerous in Manitoba as to have been the cause of some alarm to farmers, who feared that the caterpillars might attack some of the growing crops. A similar invasion occurred last summer (1901) in North America and caused at first much anxiety to farmers in the West. The species was noted at Ottawa, and the insect was extremely abundant at Nipigon and from that point westward to the Pacific. Newly emerged specimens were taken at Nipigon on the 1st July. Manitoba seems to have been the centre of greatest abundance in Canada. Mr. A. J. Dennis, of Beulah, Manitoba, writes on the 10th June: "*Pyrameis Cardui* is as a rule an uncommon species here. I have never taken more than one or two specimens in a season, but this year they are in countless numbers. They simply cover the prairies and have been flying in all directions for the last six weeks." A few letters were received from farmers anxiously enquiring whether the caterpillars which were abundant on summer-fallows, were likely to attack crops after they had finished the weeds. They were informed that this was not in the least likely. Mr. Donald Macfarlane, of Oak Lake, Manitoba, writing on the 25th June, says: "These caterpillars first appeared in this district during a spell of dry weather about two weeks ago. They were first seen on thistles and other weeds which they rapidly devoured, and are now spreading over many other plants; even the roadways are strewn with myriads of these insects, all seeming to be in sympathy with the Government's immigration policy and moving westward." In travelling through Manitoba early in July I saw large numbers of the caterpillars feeding upon the Canada Thistle, but particularly upon the Borriginaceous weed, Blue Bur

(*Echinospermum Lappula*). This was a new food plant for the species, and it is rather remarkable that it should have been so conspicuously the favourite food plant in the West. The Blue Bur is not indigenous on the prairies but has spread rapidly as an agricultural weed in Manitoba and the North-West Territories during the past year or two. Upon some fields which had been left for summer-fallowing large patches of this weed could be found stripped bare of every leaf by the caterpillars of the Painted Lady. Other plants noticed in different places, which were eaten by this caterpillar, were the Western Mugwort (*Artemisia Ludoviciana*) and the Pearly Everlasting (*Anaphalis Margaritacea*). In a few instances, caterpillars were seen upon the small Round-leaved Mallow, and were reported on holyhock and burdock. At Kaslo, B.C., I was surprised to find the larvæ feeding (30th July) on the prickly Borraginaceous plant, *Amsinckia intermedia*.

It is probable that our Canadian swarm may have come from the south and west. Mr. J. W. Cockle, of Kaslo, on Kootenay Lake, B. C., an energetic and very observant entomologist, wrote me last spring that on May 2nd a swarm of this butterfly had passed Kaslo. He says: "They were here on that date in thousands, but most of them only stayed a day or two; from which I suppose they have migrated to some other point." At the same time Mr. Cockle sent me the following interesting extract from the Spokane Review of May 26th:

MIGRATION OF BUTTERFLIES.

Spokane Review, May 26.

COUNTLESS THOUSANDS OF THEM FLYING OVER SOUTHERN CALIFORNIA.

"For weeks a remarkable migration has been taking place in southern California, and is still in progress. The migrant is a brown butterfly, known as *Pyrameis cardui*.

"At first the butterflies were noticed in twos and threes, then in dozens, then in countless thousands, all flying in one direction, to the northeast and parallel to the Sierra Madre range. Some idea of the numbers can be conceived when it is said that in looking across a lawn 90x40 feet four or five butterflies were continually crossing the line of vision, and this was true, so far as could be learned, of every lot in the vicinity.

"The insects move with a regular rate of speed, always in the same direction; now in pairs, again singly or in groups of 10 to 12. Such specimens examined show that they had traveled a long distance, and it is thought by some that the migration began in Mexico, hundreds of miles away.

"In attempting to guess at the cause, it may be assumed that it has been a favorable year for this butterfly in some region to the south, and that the countless caterpillars have changed into butterflies in such swarms that to obtain food they have begun this migration, the direction of which has been governed to some extent by the mountain range."

It may be the case that after this year *P. Cardui* will be less abundant than usual for some years, in accordance with the rule which seems to govern the occurrence of insects in general, namely, that an excessive abundance of a species generally foretells an unusual scarcity the next or the following year. Any remarkable observation concerning insects should always set the careful observer thinking, so that, if possible, the cause for the unusual occurrence may be discovered.

At the end of Dr. Scudder's article he gives the following under the head of *Desiderata*: "*Cardui* is one of the best subjects of study for those who wish to investigate the causes of irregular apparition: and only those who spend much time in the field can hope to solve the problem. A close observation of the comparative abundance of the butterfly for several consecutive years in the same locality, accompanied by the attempt to rear hundreds of the caterpillars, selecting only those which are very nearly full grown, and recording the proportion of healthy and infested ones, will probably show whether the attack of parasites is a *vera causa*.

The above is submitted to our members to remind them that there is still good work to be done even with this showy and not uncommon species. Should the insect appear again next year in any abundance, efforts should be made to carry out Dr. Scudder's suggestion with a view to solving the points raised. Exact dates of the first appearance of the butterflies and notes as to the times of greatest abundance should be carefully kept, and, if these facts are recorded by several observers at different points, they would certainly furnish much valuable information towards solving this problem.

THE NORTH AMERICAN FALL WEBWORMS.

By HENRY H. LYMAN, M.A., MONTREAL.

The name Fall Webworm, as is well known, was given by Harris to the caterpillar of the moth which he described under the name *Arctia Textor*, but for which he subsequently erected the genus *Hyphantria*, putting also in it the Many-Spotted Ermine Moth of the South, originally described under the name *Bombyx Cunea* by Drury. As I have already given in the "Canadian Entomologist" * a somewhat extended historical sketch of these moths, it is not necessary to repeat it here.

The earliest published opinion that *Cunea* Drury and *Textor* Harris were not specifically distinct, which I have been able to find, was that contained in the short paper by Mr. Graef in Bull. Brooklyn Ent. Soc., III. 14, 1880, he having taken all intergrades between immaculate and heavily spotted, and having seen the two forms in copulation, as had also Mr. Otto Meske of Albany. In the August number of the same journal, Mr. G. H. French recorded having bred both forms from a nest of caterpillars which had apparently just hatched from a single cluster of eggs deposited by a single moth. In the same year, Riley in the General Index to his Missouri Reports also placed *Textor* as a synonym of *Cunea*, but in Grote's Check List of 1882, *Textor* and *Punctata* stand, apparently, as good species, though without numbers, *Punctatissima* A. & S. being the only name given as a synonym of *Cunea* Drury.

In 1887 Riley issued Bulletin No. 10, U.S. Division of Entomology, on "Shade Trees and their Insect Defoliators," in which, writing of the Fall Webworm, he said, "The moths vary greatly, both in size and coloration. They have, in consequence of such variation, received many names, such as *cunea* Drury, *textor* Harr. *punctata* Fitch, *punctatissima* Smith. But there is no doubt, as proven from frequent breeding of specimens, that all these names apply to the very same insect, or at most to slight varieties, and that Drury's name *cunea*, having priority, must be used for the species."

Since that date, it seems to have been generally accepted that we had only one species varying greatly, and even *Congrua* Walker was supposed on Mr. Butler's authority to be merely a variety of *Cunea*. Having no evidence to urge against this conclusion, and having no acquaintance with the Many-Spotted Ermine Moth in life, and only a pair in my collection, I, as so many others continually do, accepted perfunctorily the dictum of these authorities, though living in the *Textor* region where *Cunea* does not occur, I could never really bring myself to believe that the two forms belonged to one species, and thus the controversy which started in the May 1899 number of the "Canadian Entomologist" over the question as to what species was the true *Cunea* of Drury quickened my interest in the Fall Webworm moths, and I determined to solve the problem if possible. I therefore appealed to Dr. Harrison G. Dyar to secure for me eggs of *Cunea*, and this he kindly did, instructing his assistant to get them for me.

On 3rd August I received from Washington a batch of eggs mailed on 31st July, accompanied by the moth which laid them, and which was still alive and still ovipositing.

The eggs were deposited on the underside of a leaf, and were described as follows :

Diam. $\frac{1}{2}$ mm., finely pitted, of a pale delicate green, the batch covered with white down from the abdomen of the ♀ but those laid after the moth reached me had very little of the down about them.

Riley described the eggs as being of a bright golden-yellow colour, having, on account of the pitted surface, the appearance under a magnifying lens of a beautiful golden thimble, but this is erroneous, as I have had and examined many clusters of these eggs, and all were of a pale, delicate green. Occasionally a few yellow eggs will be found in an egg cluster, but these appear to be bad ones, as I have never known them to hatch. The parent of this first brood, which I called No. 1, was a little rubbed, but so far as I could see was immaculate. It is shown on the plate as fig. 1. (See frontispiece plate).

The larvæ hatched on 11th-13th August, giving an egg period of about 12 days in the latitude of Montreal.

These larvæ were carried by me to Rockland and Portland, Me., and back to Montreal, through the White Mountains, and were thus never out of the *Textor* region. They were fed on American Elm. For comparison, I also secured a part of a batch of *Textor* larvæ from a nest on a birch tree in Mount Royal Park, but having been entrusted to a friend while I was at the seaside they were, on account of their commonness, somewhat neglected, and only about half a dozen survived. When the larvæ of both forms were mature, I immediately saw that they differed strikingly from each other. The larvæ of *Cunea* vary considerably among themselves, but only within the limits of what may be called the *Cunea* form, never to my knowledge, and I have bred not far short of a thousand of them in various broods, varying in the direction of *Textor*.

The distinction between these larvæ may be broadly stated as follows :

Cunea has the lateral broad band, light in color, not much sprinkled, and the warts on it yellowish, the upper row occasionally tinged with orange, and the hairs chiefly blackish gray. *Textor* has the lateral band heavily sprinkled with black dots, giving it a bluish appearance, the warts upon it orange-red, and the hairs chiefly foxy red-brown.

These larvæ thus differ much more than the larvæ of many allied species whose distinctness is never called in question. Probably owing to the latitude in which they were raised this first brood matured slowly, and as the season advanced it was difficult to secure any green elm leaves, and to keep them fresh for any length of time. Some of this brood seemed to be affected by some intestinal trouble, the pellets of frass remaining held to the anus by a reddish filament. One was observed to have no less than four such pellets in a chain attached to the anus. When elm was no longer to be had I changed the food to apple, and was able to secure this in a green state even after the first frosts.

Those larvæ which spun up among the leaves were placed in a box with a zinc pan in the bottom, covered with a layer of crushed quartzite kept moist, the box being covered by a pane of glass, but those which spun up attached to the floor and sides of the breeding cage were not disturbed.

The specimens kept in the damp box began emerging on 18th March, 1900, and continued to do so up till the 12th April, when I left on an Easter trip to New York, Philadelphia, and Washington. Up to that date none had emerged in the breeding cage, and I feared that they must have become dried up, but on my return home on the 21st, I found that a number had emerged, and they continued emerging up to the 16th May, being thus just one month later than those kept in a moist atmosphere.

About seventy five specimens in all were reared, though some were crippled or otherwise damaged and not worth preserving, and of these only four females were absolutely immaculate, that is, about 5 per cent. of the whole brood, or about 10 per cent. of the females. Many of the latter sex were quite heavily marked, more so than the average male of ordinary broods,

and the statement of Smith & Abbot, "the female being entirely white," is thus seen to be incorrect, though in the majority of cases it is true, and in the other broods raised by me, spotted females were of extreme rarity, not occurring at all in summer broods and very rarely in spring broods. Figures 2-11 are of this brood, showing the variation from heavily spotted to immaculate.

Had I been contented with the results attained in rearing this most remarkable brood I would have maintained that such a thing as an immaculate male *Cuneo* did not exist, and should thus have been quite as far astray in my conclusions as the many authorities who have written of these forms.

But in order to see what difference, if any, existed between the spring and summer moths, I appealed again to Dr. Dyar to supply me with a batch of eggs along with the parent moth. This he was unable to do, as he did not secure any of the female moths, but he sent me two broods of young larvæ whose depredations upon sycamore trees had just begun to attract his attention.

These broods I named A and B, and as it was too much trouble, especially for the friend with whom I left them when I sailed for England in June, to go up the mountain to my sycamore tree for fodder, the food was changed, and brood A was reared on elm and brood B on apple.

On my sudden return from England on 8th July I took over the care of these broods and carried them on to imago, but to my surprise very few of brood A emerged, though the moths from brood B emerged very freely. The dates of emergence ranged in brood A from 27th July to 19th August, and in brood B from 27th July to 13th August. The moths from these broods were hardly at all spotted, a few only of the males being lightly marked, while many males and all the females were absolutely immaculate, and so indistinguishable in the imago state from *H. Textor*, but the larvæ had been of the *Cuneo* form, though not quite so dark as the fall brood of larvæ reared in 1899. These moths are shown Nos. 13-16 summer brood A, Nos. 24-27 summer brood B.

From a mating between A and B I secured another batch of eggs, which in due time hatched and produced brood AB.

As Dr. Dyar had also been rearing a number of broods of *Cuneo* at Washington I suggested dividing broods, each sending the other a half of one of the broods, in order that we might see what difference, if any, would result from difference of latitude.

I sent a share of brood AB to Washington and received in exchange a portion of one of the Washington broods resulting from a mating of moths of the summer brood. No distinguishing number was sent with this brood, and I merely marked it " $\frac{1}{2}$ Dyar's brood." Unfortunately Dr. Dyar's assistant omitted to make a note as to which brood he divided with me, and I am therefore unable to compare my results with those obtained at Washington.

The moths of this brood from Dr. Dyar emerged from 28th April to 10th May, 1901, and were almost immaculate, only a very few of the males having a few dots, Nos. 29-33 showing the range of variation.

The result of this brood proves that a spring brood may be quite as lightly marked as the most lightly marked summer brood, and it is probable that the influence of the parents is a potent factor in determining the result, but that, other things being equal, a spring brood will be more heavily marked than a summer one, was demonstrated in the most remarkable manner in brood A.

I have already mentioned that very few of this brood emerged in July and August, 1900, the great bulk of the brood going over the winter, thus showing the tendency of the double brooded *Cuneo* of the South to become a single brooded moth in the latitude of Montreal.

The contrast in this brood between the summer emerging moths and those which passed the winter in the pupal state was most marked, as many of the males were heavily spotted, though

some of the males and nearly all the females were immaculate, only one or two of the females being lightly spotted, Nos. 17-22 showing the range of variation in the spring part of brood A.

As already mentioned, nearly all of brood B had emerged in July and August, 1900, but three or four emerged in the spring of 1901, and No. 28 is a male of that brood which went over winter, showing the same tendency to heavy marking in the spring brood, and this fact has a very strong bearing upon the question of the specific distinctness of these two forms, for if both belonged to one species, *Textor* having only a spring brood in this region, should be a spotted form instead of being an immaculate one.

In the summer of 1900, I also secured part of a brood of *H. Textor* larvæ on Montreal Mountain, and sent a portion to Dr. Dyar, but he did not succeed in getting any through. I was successful with those I retained, but, curiously enough, a few emerged in the autumn, but those which emerged in the spring came out a little later than the *Cuneas* of brood A.

The latter emerged between the 5th and 15th May, with one belated one on the 20th, and another on 26th, while the *Textors* did not begin to appear till the 19th May, and came out between that date and 2nd June. Dr. Dyar succeeded with the portion of brood AB which I sent him, but, unfortunately, I did not with the ones I retained. They, were I fear, confined too long in a glass jar, and so became unhealthy before being transferred to a cage, and died off shortly after I left on my second trip to England, so here again we were unable to compare results.

A very important point which I brought out in my experiments was the refusal of *Cunea* and *Textor* to mate. At least three times was the experiment tried, when conditions were favourable, both moths being freshly emerged, but always with the same result, although they were left together for days. That no mating took place, I am positive, as close watch was kept at frequent intervals, and in a mating of *Cunea* which was timed, copulation continued from about 11 p. m. till about 8 p. m. the following evening. The *Cuneas*, however, mated all too readily among themselves.

To sum up the results of my experiments extending from the summer of 1899 to the spring of 1901, I find :

- 1st. That *Hyphantria Cunea* varies in both sexes from heavily spotted to absolutely immaculate.
- 2nd. That *Hyphantria Textor* is invariably immaculate.
- 3rd. That the two forms differ markedly and constantly in the larval state, while *Cunea* especially varies within its own range.
- 4th. That the two forms will not mate.
- 5th. That, other things being equal, the spring brood of *Cunea* is more heavily marked than the summer brood.
- 6th. That in the north *Cunea* tends to become a single brooded, heavily marked form.

I therefore contend that my results prove beyond reasonable doubt that we have two valid species, though in the imago stage it is impossible to distinguish between an immaculate *Cunea* and a *Textor*, and that the name given by Harris should therefore be restored to full specific rank.

Now, as to the synonymy, in Neumoegen & Dyar's "Preliminary Revision,"* the name Var. *Budea* Hübner was used for *Textor*, but this reference was evidently founded on a misapprehension as Hübner's figure shows a moth with a single dot on each fore wing, exactly as in fig. 14 of my plate, and the description mentions this spot, as I am now informed by Dr. Dyar.

*Journal N. Y. Ent. Soc. I. 178.

The species should therefore stand as follows :

HYPHANTRIA. Harris.

CUNEA, Drury. (*Bombyx*).

Punctatissima, Abbot & Smith. (*Phalena*).

Budea, Hübner. (*Cyenia*).

Mutans, Walker. (*Spilosoma*).

Punctata, Fitch. (*Hyphantria*).

Ab. var. Pallida, Packard. (*Arctia*).

TEXTOR, Harris. (*Arctia*).

? *Candida*, Walker. (*Spilosoma*).

I have referred *Candida* Walker doubtfully as a synonym of *Textor*, as it is impossible to be sure that the type was not merely an immaculate *Cunea*, unless it could be shown to have come from a locality where *Textor* occurs and *Cunea* does not.

Figure 12 on the plate is shown as agreeing with almost absolute exactness with Drury's figure of *Cunea*, and Figure 23 as the nearest specimen to the very aberrant type of *Arctia Pallida* Pack. which I have been able to obtain. Sir George Hampson, in Vol. III of his work on the moths of the world, refers to *Hyphantria* the species described by Grote as *Alecicles Aspersa*, but as he admits the species is unknown to him, I consider the reference at least doubtful.

In the following summary I have endeavored to classify the individuals of the different broods, but any such classification is artificial, and merely approximate, as they merge by the slightest possible gradations from one extreme to the other.

SUMMARY.

Brood.	No. 1.	A.		B.		Dyar's.
Emerged.	Spring.	Summer.	Spring.	Summer.	Spring.	Spring.
Heavily Spotted						
♂	7		5			
♀	3					
Well Spotted						
♂	14		14		1	
♀	13					
Lightly Spotted						
♂	2		21	3		
♀	9		1			
Traces of Spots						
♂	0	5	9	9		10
♀	7	0	6			
Immaculate						
♂	0	6	12	21		14
♀	4	6	45	17	2	22

Before concluding, I desire to acknowledge the kindness of Dr. Dyar, not only in supplying me with the necessary eggs and larvae of *Cunea*, but also in carrying on similar experiments at Washington, breeding over 600 moths, the results of which I am permitted to give in the annexed Appendix, and which tend to confirm my conclusions.

I may also say that I learned through Dr. Dyar that Mr. Theodore Pergande had, from his own observations, become convinced that there were two species, the one varying from spotted to white, and the other always white. but differing in the larval state, just as my experiments have shown that they do.

To be the means of proving the correctness of a name given by Dr. Harris, for whom I have such a profound respect, is a source of gratification.

EXPLANATION OF PLATE.—(See frontispiece).

- No. 1. ♀ parent of brood No. 1.
 No. 2-6. ♂ ♂ brood No. 1 emerged March-May, 1900.
 No. 7-11. ♀ ♀ brood No. 1. emerged March-April, 1900.
 No. 12. ♂ from N. J. as close as possible to Drury's figure.
 No. 13-15. ♂ ♂ brood A. emerged July-August, 1900.
 No. 16. ♀ " " " "
 No. 17-20. ♂ ♂ " " " May, 1901,
 No. 21-22. ♀ ♀ " " " "
 No. 23. ♂ similar to Packard's *Arctia Pallida*.
 No. 24-26. ♂ ♂ brood B emerged end July, 1900.
 No. 27. ♀ " " 5th August 1900.
 No. 28. ♂ " " May 1901.
 No. 29-31. ♂ ♂ Dyar's brood emerged May, 1901.
 No. 32-33. ♀ ♀ " " emerged May, 1901.

APPENDIX.

Results obtained at Washington, by Dr. H. G. Dyar in carrying on parallel experiments 1900-1901.

SUMMER MOTHS.

Brood

- D 1* Eggs on sycamore, Washington, D. C., June 1, 1900. No moths.
 D 2* On pear, Hollydale, Pa., May 24th, 1900. Bred at Washington, D. C., 23 moths (13 ♂ 10 ♀) white, 4 ♂ with traces of spots.
 D 3* On Sycamore, Washington, D. C., June 1, 1900. 36 moths in July-August (19 ♂ 17 ♀) white, 3 ♂ slightly, 1 ♂ distinctly spotted.
 D 4* On Sycamore, Washington, D. C., in stage II, May 29, 1900. Moths in August, 90 moths (43 ♂ 47 ♀) white, 3 ♂ with traces of spots.
 D 5* On Sycamore, Washington, D. C., June 1, 1900. Moths in August, 4 moths (1 ♂ 3 ♀) white.
 D 6* On Sycamore, Washington, D. C., June 1, 1900. Moths in August, 145 moths (77 ♂ 68 ♀) white, 3 ♂ with traces of spots.
 D 7* Eggs from ♀ on Sycamore, Washington, D. C., hatched June 11, other broods in stages III and IV at the time. Moths in August, 204 moths (103 ♂ 101 ♀) white, 6 ♂ with faint grayish spots.
 D 8* On Mulberry, Montreal, Ga., (J. H. Heard), June 8, 1900. Moths in August, 7 ♀ white.

SPRING MOTHS.

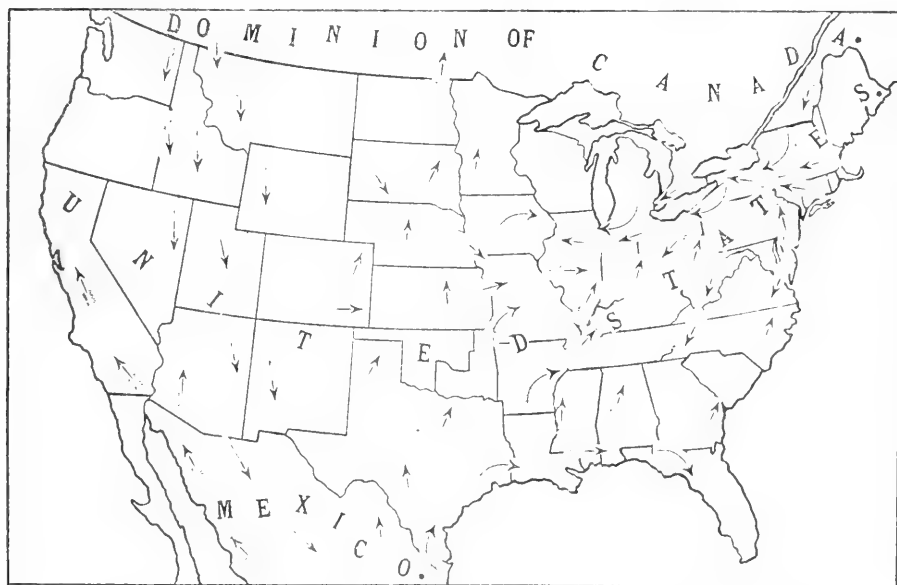
- D 9* Mating of moths of D 4 end of July, 1900, Moth 1 ♀ white April 24th 1901.
 D 10* Mating of moths of D 7 August, 1900. Moths March 24-May 2, 1901, 28 moths (11 ♂ 17 ♀) ♂ all lightly spotted, ♀ all white.
 D 11 Brood of H. Textor from H. H. L., Montreal, no moths.
 D 12* Another mating of D 4 end of July, 1900, Moths March 28-May 4, 1901, 20 moths (5 ♂ 15 ♀) most of them spotted, none heavily, but 1 ♂ 5 ♀ white.
 D 13* A mating of Mr. Lyman's broods A and B sent from Washington 30th May, 1900, and the larvæ of brood AB returned to Washington. Moths March 24-May 1, 1901, 46 moths (42 ♂ 4 ♀) Spotted, some heavily, 3 ♂ and 3 ♀ white.

THE TREND OF INSECT DIFFUSION IN NORTH AMERICA.

BY F. M. WEBSTER, WOOSTER, O.

American entomologists have for many years been engaged in observing, defining and recording the distribution of species of insects and their progress, if of a migratory nature. In earlier days, when entomologists were few in number and widely scattered, there was little opportunity for serial observations or combined studies. But now, with entomologists in every State, the distribution of species can be more thoroughly studied and their movements, if such occur, carefully traced across State after State with surprising promptness and accuracy.

While it is not the object of this paper to gather up all the facts bearing on this subject that are scattered through our literature, it does seem proper, at this time, to sketch, tentatively at least the possible if not probable paths along which some insects, once unknown, but now common, have made their way to their present areas of habitation.



Map 1.—The Trend of Insect Diffusion in North America.—Webster.

Acquisitions to our insect fauna have come to us, almost exclusively from two sources, viz., either by introduction amongst articles of commerce or through natural influences, in the latter cases coming either from the north or the south, generally the latter.

The Appalachian mountain system on the east and the Cordilleran mountain system on the west, while they do not prevent the introduction of foreign insects along our sea coasts, they do present more or less impassable barriers to the direct progress of such insects inland. In the case of the Cordilleras these appear to separate the northward flowing stream of tropical and sub tropical species in its onward course, sending one portion along the Pacific coast and the other along the coast of the Gulf of Mexico, the latter sometimes spreading broadly inland, while the former holds more closely to the coast. The influence of the high plateau in Mexico on the eastern branch of this insect stream, will, some day, offer material for a most interesting study, even if it does not solve the problem of the evolution of several of our common insects. The Appalachian system does not approach the gulf coast at its southern terminus, but leaves a broad avenue that enables species moving eastward to pass on along the gulf to the Atlantic coast and thence northward. It does, however, to the northward form an almost impassable

obstruction to the directly westward migration of insects from east to west, broken only in the State of New York and the country adjacent to the north and south shores of Lake Erie. Here we have a huge gateway through which nearly or quite all species imported from Europe, landing on our eastern seacoast, north of the mouth of the Potomac river at least, make their way into the comparatively level country beyond. It is barely possible that the valley of the Big Kanawka river in West Virginia and Cumberland Gap may offer passage ways for an occasional species, but of this we have no proof as yet. In the Cordilleran system there do not appear to be any such openings or gaps for the outflowing and spread of migrating species, except, perhaps, in extreme southern California and Arizona, a country so arid that few species can take advantage thereof, if it really exists, hence, a separation in South or Central America usually remains permanent, while in the case of the Appalachians, a species may work its way south along the Atlantic coast to the Gulf, and in a comparatively short time mingle with the northern branch that has made its way west to the great lakes and thence southward.

Besides these, there are paths of migration from the north southward, but these are confined to the two mountain systems now under discussion.

I will now take up each of these paths or trails of migration and give a few illustrations to make my points more intelligible. (See Map 1.)

The imported cabbage butterfly, *Pieris rapæ*, as is well known, was first observed in the vicinity of Quebec in 1860. From here it gradually spread south into New England and west through New York, so that it actually invaded Canada from the United States in 1872, and a year later, in the spring of 1873, it appeared at Cleveland, Ohio, in limited numbers.¹

Many years ago one of the Dung beetles, *Aphodius fossor* L., which occurs in Europe, was introduced into the same section of country as the preceding, and like it spread southward into New England, and is now only being found occasionally in northeastern Ohio, though it was included in the list of Lake Superior species in 1878 by Hubbard and Schwarz, but not in the 1880 list of Reinecke and Zesch of species found within 15 miles of Buffalo, New York. In this case it evidently spread faster through Canada, but came to Ohio by the way of western New York.

The Asparagus beetle, *Crioceris asparagi*, introduced from Europe many years ago, first appeared in Ohio in the northeastern portion of the state, precisely as it made its way into Canada by way of western New York. *Crioceris 12-punctatus* has not yet been found in the State of Ohio but is to be expected within a year or two.

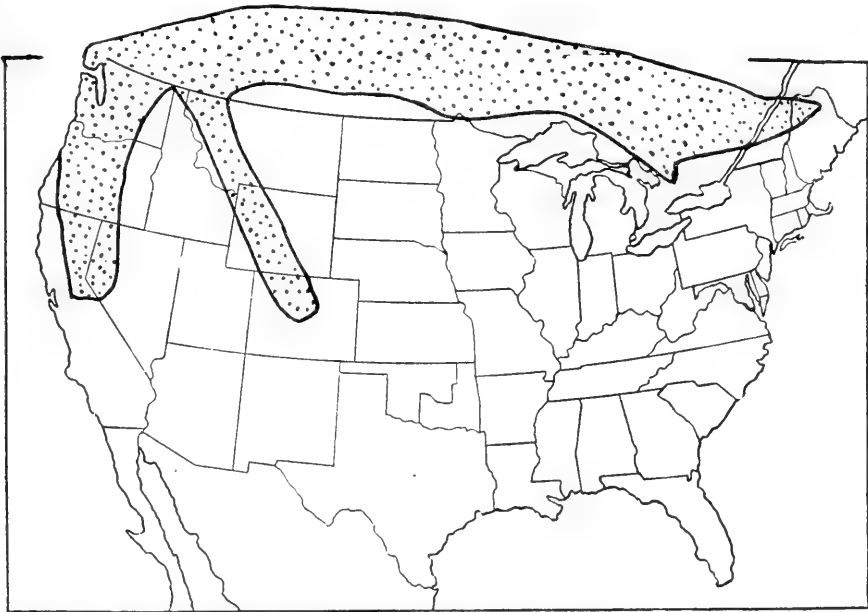
The clover leaf weevil, *Phytonomus punctatus*, and the clover root borer, *Hylastes obscurus*, both imported from Europe and both first coming to notice in western central New York, were first reported in Ohio in the northeastern counties. It is true that a single specimen of the former was taken from the crop of a crow shot in Michigan in 1892.² Yet had it invaded the State of Ohio from that direction the fact would have been shown by its presence in the clover fields of the farmer. I found it abundantly at Chautauqua Lake, New York, in August, 1888, and it must have entered Ohio a year, or at most two, afterwards. It is true that Mr. Dury found it near Cincinnati in 1892 and Mr. Hine in Lucas County the following year, but it did not become noticeably abundant until long after the farmers in northeastern Ohio were complaining of its attacking clover. The *Hylastes* also was found about Cincinnati soon after its appearance in northeastern Ohio, but like the *Phytonomus* it was probably carried into some of the tributaries of the Ohio river, possibly in northeastern Ohio, during the high waters of spring and down stream, being left by the receding water with driftwood and other debris, far back among the cultivated lands along the river itself.

¹Scudder The introduction and spread of *Pieris rapæ* in North America, 1860-1885. Mem. Bos. Soc. Nat. Hist. Vol. IV., No. III.

²The Common Crow of the U.S., Burrows and Schwarz: Bull. 6, U. S. Dep. Agr. Div. Ornithology and Mammalogy.

Even the Horn Fly, *Hematobia serrata*, was first reported in the State at a point some thirty miles east of Cleveland, though it appeared elsewhere soon after, and now we have another illustration in the Willow and Poplar Curculio, *Cryptorhynchus lapathi*, found at Ashtabula in the extreme northeastern county within a few weeks. This last appeared about Buffalo, New York, in 1896.

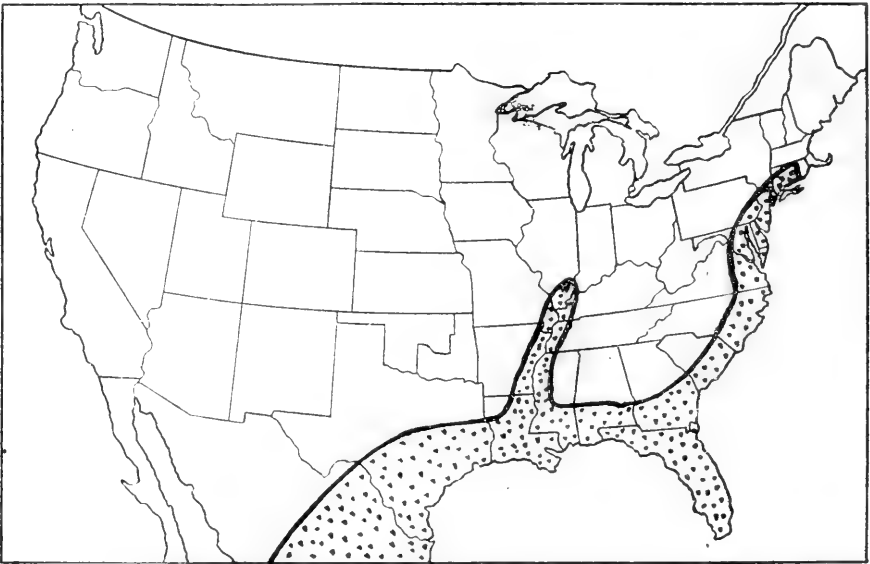
The foregoing illustrations will, I think, show clearly that there is a gateway opening into Canada between the east end of Lake Erie and the western end of Lake Ontario as wide as the Niagara River is long, through which insects introduced from Europe make their way, frequently even when such have been first introduced into Quebec, seemingly preferring to make their way westward to the south of Lake Ontario instead of to the north of it. The gateway on the United States side is along the south shore of Lake Erie, and between it and the northern terminus of the Alleghany mountains.



MAP 2.—The dotted area shows territory over which *Erynnis Manitoba*, the Canadian Skipper Butterfly, occurs and illustrates the southern trend of northern species. (Adapted from Scudder.)

The eastward trend of insect migration is followed, either by species whose native habitat is along the foothills of the Rocky Mountains, or else by such as have come up from the far south and swayed broadly to the eastward across northern Missouri, Iowa and possibly southern Minnesota. The spread of the Colorado Potato beetle, *Doryphora 10-lineata*, is a good illustration, while the Box Alder bug, *Leptocoris trivittatus*, which is slowly but surely making its way eastward, having, as Dr. Forbes informs me, reached eastern Illinois, is another example. Of those that have come up from the far south and fallen into this trend of migration, probably *Diabrotica longicornis* will offer the best illustration, and this will lead me to the discussion of the northward spread of tropical and sub-tropical species. This species was first observed along the eastern slope of the Rocky Mountains, and up to within the last thirty-five years was a comparatively rare insect, found in summer on the blossoms of golden-rod and thistles, and probably occurred, locally, far to the eastward, possibly reaching the Atlantic coast within the last twenty-five years. The writer can well remember when it was of uncommon occurrence in northern Illinois, where now it literally swarms, under certain conditions of Indian corn

culture, to which crop it has come to be a veritable pest. Somewhere in the great corn fields of Illinois and perhaps Iowa, this insect acquired the habit of breeding in the roots of corn, and what seems to be a corn feeding race has sprung up and has slowly made its way eastward, having now reached the eastern half of Ohio. As illustrating this feature of its diffusion, while I have been closely watching its progress in western Ohio, I was unable for ten years to find a single individual about Wooster, situated about 65 miles from the eastern line of the State, and about 35 miles from Lake Erie. In the summer of 1900, however, I found a single individual in my garden on the common sunflower, and, judging from past experience in other States as well as in western Ohio, we shall soon have the insect in abundance. Elsewhere* I have discussed



MAP 3.—The dotted area shows the territory over which *Lerema accius*, the Clouded Skipper Butterfly, occurs. This is the area covered by the northern trend of southern species. (Adapted from Scudder.)

the diffusion of the genus at considerable length, and it is unnecessary to repeat here what was there stated, except to again call attention to the fact that our *D. vittata* has a very close relative in *D. trivittata* on the Pacific coast and that our *D. 12-punctata* has an equally near relative in the *D. soror*, also of the Pacific coast, while each has an intermediate species that seems to connect the two in each case. This phenomenon I attribute to the fact that the original stem species may have become separated far to the south, and one branch followed the western slope and the other the eastern, Prof. Cockerell's *D. vittata* var., *incerta* coming between the former and *D. trivittata*, would seem to give us an illustration of an intermediate species in the process of evolution, while in *D. trilineata*, which occupies a similar relation to *D. 12-punctata* and *D. soror*, the evolution has advanced further and we have what we term a good species. From some more recent studies of *Myiochrous denticollis* and allied species of that genus, it would seem that something similar might have taken place with reference to that species as well†.

The southern terminus of the Appalachian system has a similar effect in dividing the streams of insect migration, after such have passed to the eastward along the gulf coast, one branch keeping along the Atlantic coast and the other to the west of the mountains, but without any such influences on the species as seemingly occurs in Central America and Mexico. Thus, there

*Jour. N. Y. Ent. Soc., Vol. III, pp. 158-166; Vol. IV, p. 67.

†Loc. Cit., Vol. IX, p. 127.

is no perceivable difference between the *Dynastes tityus* that breeds in the southern portions of Illinois, Indiana and Ohio, and those found some distance up the Hudson River in New York. The same is also true of the Bag Worm, *Thyridopteryx ephemeraformis*, which along the sea coast extends northward to Massachusetts, and in the west it has been sent me from within twenty-five miles of Lake Erie, though it is but fair to say that this was in case of a single sack, the species not occurring abundantly north of Columbus, in this State, and, until quite recently, it was not to be found even that far north, yet there is no apparent difference between Ohio and Massachusetts specimens, so far as I have been able to learn. The chinch bug, *Blissus leucopterus*, may, perhaps seem to offer an exception in its abbreviated wings along the shores of the Atlantic, but as we have the same phenomenon in the same species on the Pacific coast, it would seem that it is due to maritime influences. If one will take almost any study of the distribution of our species of insects and examine it closely, he will be surprised at the number that extend their habitat south into Central and South America, and will get the impression that many of our species really extend from the tropical countries northward, instead of from north to south, as it is usually given by our systematists. A good illustration is afforded by a recent "Review of the Tettigoniidae of north America, north of Mexico," by Mr. Elmer D. Ball, who, after the common usage, gives the species as occurring from its northernmost known home south when in the cases of 19 out of 26 species considered, this statement should have been reversed. These illustrations only convey a limited idea of the wealth of material awaiting the student of the origin of our insect fauna.

There remains only one more tide of insect migration to consider and that from the north to the southward. Mr. Schwarz* has given two exceedingly good illustrations of this, one, *Aphodius rufipes*, which occurs all over Europe and Siberia, but in North America only in the Alleghany mountains; the other a Carabid, *Nomius pygmaeus*, which is found in Oregon and Washington, Lake Superior, Ottawa, Canada, Nova Scotia, and on the high mountains of North Carolina. Our commonest lady beetle, *Megilla maculata*, is found as far south as Chili, though at sea level, a large and developed variety occurring in the Amazon district of South America.† Our *Pyrameis hunteri* has also been taken in Peru, at an altitude of 9,803 feet above the sea. The White Mountain Butterfly, *Eneis semidea*, as is well known, occurs in the White Mountains of New Hampshire, Labrador, and on the high mountains of Colorado. There are other equally interesting illustrations of this southward trend of arctic and boreal species, but I have not time to enumerate them. I will close this paper, however, by a significant statement made by Dr. Henry Skinner in the *Canadian Entomologist* of October, 1893, as follows: "In the species that fly from the Atlantic to the Pacific, and also exist in Europe, it will be found that the Pacific coast examples far more closely resemble European ones than those individuals found on the Atlantic slope."

THE IMPORTED WILLOW AND POPLAR CURCULIO.

Cryptorhynchus lapathi Linn.

By F. M. WEBSTER.

My reason for treating this insect at considerable length at this time is, that it has passed the Alleghany Mountains and entered the middle west, having been found the present autumn near Ashtabula, in the extreme northeastern Ohio, by one of my assistants, Mr. A. F. Burgess, acting under my direction. Previous experience with imported insects that have made their way to the west, led me to believe that we should sooner or later find it in Ohio, and that it

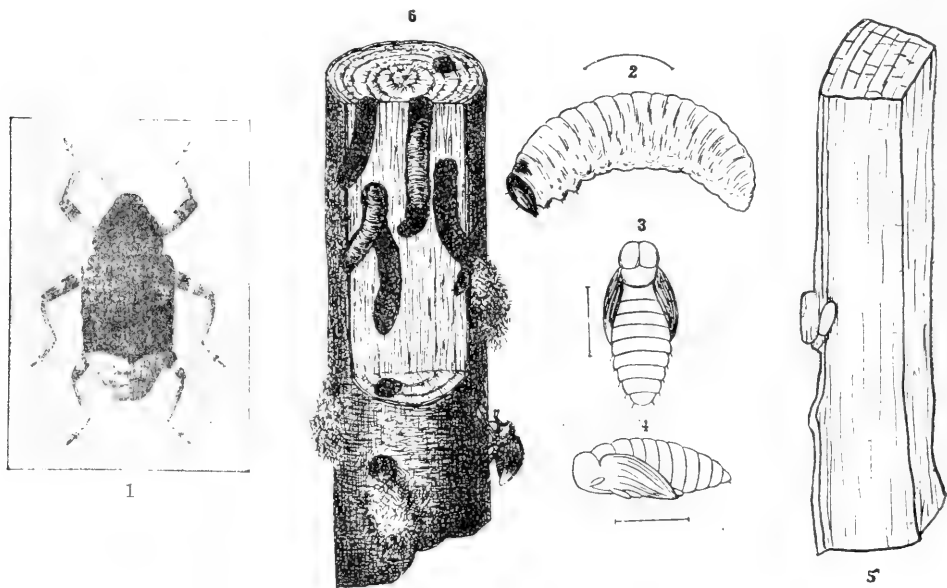
* Proc. Ent. Soc., Washington, Vol. I., p. 186.

† Travels Among the great Andes of the Equator, Appendix, p. 57.

would first appear in that part of the State, therefore Mr. Burgess was instructed to search for it this fall as opportunity offered, and a single female was found in the act of ovipositing on Oct. 5th, in willow, growing along a small stream just east of the City of Ashtabula.

DESCRIPTION OF THE MATURE INSECT.

The insect is one of the snout beetles or curculios, related to the plum curculio, but much larger, being from 6.5 to 7.5 mm., about one-third to three-eighths of an inch, in length; body dull black with little spots or tufts of jet-black scales or hairs on the thorax and wing covers; scattered over the forward half of the wing covers are minute white scales which almost cover the posterior third, and form a somewhat V-shaped marking between this and the thorax. The body is coarsely pitted, and the femora, or first joints of the legs are spined. Plate, Fig. 1.



The Imported Willow and Pop'ar Curculio.—(Webster.)

Figure 1, *Cryptorhynchus lapathi*, adult, enlarged. Original.

Figure 2, larva; figures 3 and 4, pupa. After Jack.

Figure 5, egg enlarged, as placed by female in bark of willow. Original.

Figure 6, illustrating larvae burrowing in the solid wood. After Jack.

DESCRIPTION OF THE LARVÆ OR YOUNG.

When fully developed these are fleshy, footless, whitish borers, having somewhat the appearance of grubs, with small brown heads and darker brown jaws. Plate, Fig. 2.

DISTRIBUTION OF THE SPECIES.

The insect is common in Europe, ranging over Siberia and Japan, but whether it extends further south into Central Asia is not known. In the United States it is known to occur from New Jersey to Massachusetts, and westward through New York and in north-eastern Ohio, having without doubt pushed its way along the south shores of Lake Erie, from Buffalo, N.Y., where it was first observed in the summer of 1896.

HISTORY OF THE SPECIES IN OTHER LANDS.

The species was described by Linnaeus in his "Systema Naturae," in 1763, its habitat being given as Europe, and found on *Salix* and *Rumex*, willow and dock. Later, it received attention from Fabricius in his "Systema eleuterarum, 1801; Syst. Entomologia, 1775; Spec. Insectorum, 1781; Entom. Systematica, 1792," and later by Zetterstedt, Mathieu and Kaltenbach. It is included in Turton's Linnaeus, 1806, Vol. II., p. 231. Ratzeburg, in his "Die Forst-Insecten," 1839, p. 155, briefly characterizes the insect, and states that it takes its name from the large-leaved dock, *Lapathum*, of the ancients, on which it sometimes sits. In Silesia it is called the alder destroyer (*Erlenwurger*). In July, 1824, in the vicinity of Liegnitz, a whole alder plantation was destroyed by it, and even a large number of trees ready for cutting did not escape. Willows were also destroyed by it. Nordlinger, in "Nachtrage zu Ratzeburg's Forstinsekten," 1856, p. 15, says that, according to Herr Suffrian, it occurred on low willows four or five feet high at the bases of the branches, and also on these last, and in June and July it was found in great numbers at Hohenheim on Canadian poplars, and also on white willows, where it would remain for hours with its snout buried in the spongy lenticels.

Herr Hahn, wood commissioner of the district of Laupheim, observed in the forest of Ochsenhauser, on a strip of land on which both deciduous and coniferous trees were growing, that the birches five to eight feet high were broken off about three feet below the top, and were hanging down. One inch below the break was a worm-hole filled with worm-dust and wood shavings, in each of which was found a yellowish white larva with a brown head, which, after from eight to fourteen days, developed into one of these curculios. Herr Hahn considered that in this case the insect had destroyed the growth of two years.

In 1867, Brehm and Rossmassler, in "Die Thiere des Waldes," Bd. II., p. 171, under the term "Der Erlenrusselkafer," state that they have only noticed the insect in the mountain region, where it constantly works on the white alder, *Alnus incana* L., hardly a bush along the brooks and forest borders being free from the pest, the branches and trunks attacked readily breaking off.

In 1868, Ratzeburg again takes up the species in his "Die Waldverderbniss," dealing with it much more thoroughly than he had been able to do in his previous writings, and calling attention to the observations of Zebe and Herr V. Kamptz, relative to the injuries done by the insect, the latter having observed the habits of the beetle in Mecklenberg-Strelitz for many years. He states that an annual generation is the rule, and hibernation, therefore, occurs in all stages, most seldom in the larval state. The point that the beetle prefers isolated trees and does not like a wet locality well, is repeated, but he is still reluctant in classing the black alder as a common food plant, though not doubting that it is one of the food plants. In 1869, in "Die Waldverderber," pp. 171, 172, he states that the eggs are laid in May, the normal season, usually on alders—the black rather than the white—much more rarely on poplars, birches and willows, and the beetle prefers the young shoots or branches two to three years old. He is seemingly much perplexed over the fact that, while the beetles pair and the females oviposit normally in May, they were also abundant in August.

In 1881, Dr. Bernard Altum, in "Forstzoologie," III. Bd. abth., p. 220, opens his discussion of the species by the interesting statement that there are 221 species of the genus *Cryptorhynchus*, distributed over the entire earth, while Taschenberg, in "Brehm's Tierleben Insekten," 9 Bd., p. 163, 1892, states that *C. lapathi* is the only European representative of a South American genus. I may add here that we have now 16 species inhabiting North America, north of Mexico, the majority of them inhabiting the southern or south-western States. Dr. Altum wrestles with the life history, and does not clear up the obscurity, but states that while the sexes pair and oviposit in May, they may be observed pairing in September. there being a noticeable falling off in point of numbers during July. He leaves the subject by allow-

ing a two year generation; that is, covering a portion of two calendar years, but completing their life cycle within twelve months.

The life history is given as follows, as observed in Silesia. Here, again, the white alder was seemingly preferred. The larva first works flatways under the bark, and then goes straight, ascending into the wood. Fig. 6, Plate. The larva makes the first chamber under the bark the first summer, and after hibernation begins to excavate its gallery into the sound wood, ascending as a steep passage—sometimes as a broken one—still directly into the sapwood, and before pupating the larva reverses its position and lies with its head downward in the burrow. Besides the white alder *Alnus incana*, black alder *A. glutinosa*, and of the willows, *Salix purpurea*, *S. viminalis* and *S. triandra* are given as food plants, coupled with the statement that the willows along the railroads were badly injured, and in many places entirely destroyed by the ravages of this insect.

Judeich and Nitsche, in "Lehrbuch der Mitteleuropaischen Forstinsektenkunde," II. Abtheilung, 1889, deal at length with the insect, but do not clear up the obscurity in its life history, viz., do the beetles emerging in the fall come from eggs laid in the spring of the same year, or from those laid the preceding year? The eggs are, for the most part, deposited singly in the bark of young alders, both black and white, and willows, including, besides those previously mentioned, *Salix cuprea*, and the larvæ eating out a hollow space under the bark, later force their way upward and deep into the wood. In case of small growths they work only in the centre. Before pupation the larva turns head downwards and prefers to hibernate in the larval chamber, climbing down the chamber when ready to emerge, and eating out a round hole in the bark for exit, near the place where the larval injury began. In proof that the beetles do not hibernate outside, the observations of Taschenberg are cited, who observes that where its dwelling-places about Halle were flooded during the winter, it was never to be found among the floating reeds and underbrush.

Eckstein, in "Zeitschrift für Forst-und Jagdwesen," XXIII., Bd. 1891, p. 378, states that single willows in the forest botanical garden were attacked by this insect and badly injured. He also calls attention to the fact that, in badly infested stems, the larvæ frequently take a descending course instead of an ascending one, and also that the beetle does not gnaw a separate exit after leaving the pupal chamber, but follows the larval gallery, and makes its exit through openings made by external agencies.

Taschenberg, "Brehm's Tierleben, Insekten," 9 Bd., p. 163, 1892, states that on the banks of the Saal, near Halle, the larvæ live in the old gnarled root-stocks of the basket willows, causing these to die gradually, earlier than they would otherwise have done, and that in alder nurseries the larvæ do serious damage, and that they destroy plantations of young birch. Tubeuf, in "Forstlich-Naturwissenschaftliche Zeitschrift," I. Jahrgang, p. 387, adds the Alpine alder, *Alnus viridis*, to the list of food plants of the species, and finds fully developed beetles in the burrows in September, where the weather is cold and it frequently snows during that month.

HISTORY OF THE SPECIES IN AMERICA.

The first published record of the occurrence of the insect in America is by William Juelich, in "Entomologica Americana," Vol. III., p. 123, 1887. Mr. Juelich, early in June of that year, took a section of willow that had been blown down near West Bergen, New Jersey, and from it on July 3rd there emerged two adults, and later he succeeded in getting ten more from pieces of the same willow. He states also that he had, five years before (1882), collected a single specimen on willow near Williamsbridge, about twelve miles from where he secured his pieces of willow from which he reared the later specimens, and also that Mr. Ottomar Dietz had taken a specimen on Staten Island. From the pieces of willow Mr. Juelich also reared three specimens of an Ichneumon, *Ephialtes irritator* Fab., and, as no trace of other insects inhabiting the

pieces of willow could be found, it was presumed that the *Ichneumon* was a parasite on the beetle. In the "Canadian Entomologist," Vol. XXIII., p. 221, 1891, Prof. John B. Smith stated that nearly all of the clumps of willows near Arlington and Newark, New Jersey, and also some fancy garden trees had been killed by the insect. The next published notice is by myself in "Journal of the New York Entomological Society," Vol. V., p. 30, March, 1897. In company with Mr. Ottomar Reinecke, of Buffalo, I had, on August 24th of the preceding year, taken the insect in considerable numbers near that city, where it had only just been discovered by Mr. Reinecke. Dr. A. D. Hopkins, of Morgantown, W. Va., also accompanied us, and larvæ (Plate, fig. 2), pupæ (figs. 3 and 4) and adults (fig. 1) were all secured. My beetles were collected in a cyanide bottle, strongly charged and freshly made. The beetles remained in this bottle some six or seven hours, when they were removed and placed in small tin boxes. The following morning, the 25th, they gave no signs of life, but after I had returned home, on the 29th, not only were all of them found alive when I opened the box, but several of them were pairing. They were then placed on willow, but, though they did a large amount of puncturing, and would remain for hours with their snouts embedded in the bark, as has been observed in Europe, I was not able to secure a single egg, though some of the beetles survived until early in November (*loc. cit.*, p. 204).

The next contribution to American literature relative to the pest, is by Mr. J. G. Jack, of the Arnold Arboretum, in "Garden and Forest," Vol. X, p. 394, October, 1897. Mr. Jack states that the insect had been known about Boston and Cambridge, Massachusetts, for many years, and for several years had been destructive to almost all species of willows growing in the Arboretum. It had been found burrowing in nearly all of the native willows except a few mountain or very slender stemmed species, too small to afford sufficient tissue in which to excavate their chambers or feed freely. (Plate fig. 6.) Of the foreign species of willows, the white willow, cracked willow and laurel leaved willow, were all affected, but less seriously than the Babylonian weeping willow. All of the species of poplar in the Arboretum, particularly while young, had been attacked, and to a less extent the dwarf birch, *Betula pumila*, and the Red River birch, *B. nigra*. So abundant was the pest, and so extensive its ravages, that it was hardly possible to find a good healthy plant among the scrubby willows about Boston. The beetles were found on the bark, and sometimes on the foliage, in July and August. Other information is given, taken from European authors.

In "Psyche," Vol. VIII., p. 371, June, 1899, Mr. A. H. Kirkland calls attention to the fact that, about some of the shore towns in eastern Massachusetts, this insect has become a serious enemy to the Balm of Gilead trees, which, on account of the somewhat marshy land, constituted by far the most common shade tree, and so great was the injury that at that time it was almost impossible to find a sound tree of this species, all having been weakened by the attacks of this borer, and later broken down by the ice storms and high gales. Serious damage in nurseries is also recorded. Mr. Kirkland began in June, 1897, a study of the life history of the species in this country, and as he has very kindly placed his notes in my hands for use in the preparation of this paper, I take pleasure not only in appending them herewith, but in thanking him most heartily for allowing me to use them. I am also further indebted to Mr. Kirkland for translations of the European authors from which I have so freely drawn. The notes just mentioned are as follows:—

- June 30, 1897. Larvæ abundant at Winthrop, Massachusetts, boring in Balm of Gilead trees; larvæ nearly full grown, and some forming cells to pupate. Before pupating they enlarge their burrows to the outlet, then retreat to the upper end and transform in a neat chamber. 57 larvæ taken from a stick $1\frac{1}{2}$ inches in diameter, and 2 feet long.
- July 3, 1897. Larvæ common at Saugus, Massachusetts, in our native trembling poplar.

- July 4, 1897. Many small beetles (*Ips fasciatus* and its allies) abundant in filth which oozes from the burrows.
- July 14, 1897. From the middle of June to the middle of July sap flows freely from exits of burrows. Pupa always headed towards exit. Large infested branches wilt and die.
- July 22, 1897. In infested branches taken June 30th, beetles are matured to-day. I split open branches every day from June 30th on, and found nearly all the larvae pupated July 3rd and 4th. Eighteen days will pretty closely cover the length of pupal stage.
- July 28, 1897. Plenty of beetles in the infested sticks and only one pupa found. But few of the beetles have emerged from the burrows as yet.
- July 31, 1897. Beetles emerging freely.
- August 17, 1897. Beetles common. Feeding on petioles and poplar leaves.
- May 22, 1898. Captured one imago at Medford. Probably an over-wintered specimen.
- May 29, 1898. Found plenty of larvae in native willows at Medford. This shows that the insect breeds in our woodlands
- June 6, 1898. Larvae are feeding rapidly and throwing out worm-dust from their burrows.
- June 15, 1898. Larvae boring in *Populus monilifera*, at Bedford, Massachusetts.
- June 27, 1898. Larvae nearly full grown.
- July 5, 1898. Beetles mating at Medford.
- July 10, 1898. Larvae beginning to pupate, the date being later than last year. The small larvae hibernate in the cambium, enter the wood in the spring, and make a rapid growth to maturity. The base of young trees is a favorite point of attack; older trees are more difficult to affect.
- July 16, 1898. Found larvae boring in silver poplar (*Boliana poplar*).
- July 30, 1898. Beetles abundant at Springfield, Massachusetts, along the Connecticut River; feeding on the cotton wood.
- September 15, 1898. Imagoes mating at Malden.
- September 21, 1898. Beetles abundant and feeding on petioles and young twigs, at Winthrop, Massachusetts.
- April 5, 1899. Found minute larvae under leaf scars in poplars at Abington, Massachusetts. Larvae $\frac{1}{16}$ th of an inch long, curved, pale greenish, and only slightly active.
- May 10, 1899. Young larvae abundant in bark beneath leaf scars on poplars at Winthrop. Burrows about one inch long now mainly in the bark, and full of black castings.
- May 18, 1899. Larvae now entering the wood, having finished feeding in the bark.
- June 4, 1899. Larvae 7 to 10 mm. long and feeding rapidly.
- October 2, 1899. Found eggs of this insect for the first time, in poplars, at Wyman's Nurseries at Abington. They were wedged in under the bark in cavities at the base of young branches. The beetle gouges out a hole for each egg, and leaves from one to four in a spot. In some of the infested sticks the eggs have hatched and the tiny larvae have commenced feeding. This finding of the eggs closes the gap in the life history of the insect.

Unless there are adults in spring, which, as in Europe, deposit eggs in May, and Mr. Kirkland overlooked these, which is hardly possible, he has given the full life history, for the first time. It is possible that the single annual brood is not, as seems to be the case in Europe, intercepted by winter. Certain it was that the insect was pairing at Buffalo, N. Y.,

August 24th, 1896, and ovipositing at Ashtabula, O., on October 5th, 1901, though in this latter case it might have been by a belated female. Mr. Burgess examined many poplars in the city of Ashtabula without finding the insect, and but a single female was to be found on the willows in a deep ravine near the city. This female was observed in the act of oviposition, the place selected by her being one of the corky growths, common on the willow bark. The day was cool, and the beetle worked on the south side of the tree, pushing her snout into the corky bark as far as it would extend, and worked it about so that quite a cavity was excavated. She was thus engaged when found, and continued to work for forty minutes. At the end of this time she reversed her position, and, placing her ovipositor in the cavity, forced it in the entire length, her position at the time being parallel to the ground. After remaining motionless for three minutes she began to move the abdomen and ovipositor upward and downward, and, though something could be observed passing into the cavity, whether the egg or some mucilaginous matter could not be determined, but in any case, when she had finished her work the cavity was completely closed. Turning about again she seemed to examine her work with snout and antenna, and, apparently satisfied therewith, she sought out another similar corky growth and began her work when she was captured, remaining alive, however, until October 10th. The section of willow showing the egg as it was placed by the insect is shown by fig. 5, plate. It will be noticed that it was jammed into place, and probably packed securely with the surrounding tissue, reduced to pulp by the jaws of the beetle.

The egg is oval, pale yellowish white; length, 1.5 mm.; width, 0.8 mm.

It would appear from the foregoing that this insect has come among us to attack our willows, poplars and probably some other shade and ornamental trees that are found in our parks, cemeteries and other public grounds, as well as along our streets; also, that it is a nursery pest as well. The Carolina poplar, on account of its symmetrical form and rapid growth, has been very largely planted during the last ten years, and it remains to be seen what effect this foreign insect will have upon these, especially as Mr. Kirkland informs me that, at present, the species is a serious pest in nurseries where poplars and willows are propagated, and on low lands where these are the principal shade trees.

PREVENTION.

If, as now seems to be the case, the insects live over in the bark as very young larvae, it will be difficult to detect their presence until the next summer, so that burning infested trees in winter will be impracticable, as the presence of the borer will only show after the injury has been done and the culprit escaped. Something may be accomplished by burning in late spring such trees as are seen to be infested, thus destroying the pest before it develops and escapes. The outlook, however, is not encouraging in the matter of protecting trees from attack.

THE COMMON CHEESE MITE, TYROGLYPHUS SIRO, LIVING IN SPOROTRICHUM GLOBULIFERUM.

By F. M. WEBSTER.

Since the year 1896 I have been distributing from one hundred to several thousand small boxes of this fungus each year to farmers in Ohio, to be used against the chinch bug, *Blissus leucopterus*.

In the preparation of this fungus for distribution, we have followed the more recent method of cultivating it in quantity on a base of sterilized beef broth and corn meal, but recently an unexpected difficulty has arisen in the shape of the ravages of the common cheese mite, which makes its way into the boxes of the prepared material, after it has been dried and put away for use, and reduces the contents of the boxes to powder, so that it is simply a crawling mass.

Curiously enough, despite the attack of these mites, one of my assistants, Mr. Newell, took a quantity of this mass of powdered meal and mites and with this was enabled to get a fine culture in a bottle of the sterilized meal and broth dough.

The mite attacks not only cheese but sugar, flour, cured hams, wool, seeds and many other articles of food and commerce. Evidently it is in this case the dough that attracts them, but as against them this species of entomogenous fungi is clearly harmless.

THE HIBERNATION OF INSECTS.

By Prof. W. LOCHHEAD, ONTARIO AGRICULTURAL COLLEGE.

A very puzzling question, yet a very important one, is frequently asked: "Why do some insects pass the winter as adults; some as pupae; some as larvae; and others in the egg stage?"

To answer this question the entire history of the development of insects would require to be known, for there seems to be but little doubt that the particular hibernation form is the visible expression of the influence of many factors, such as change of environment, nature and abundance of food, and change of habit. The question of hibernation is clearly closely associated with that of metamorphosis, and any intelligent discussion of hibernation must necessarily deal with the causes of metamorphosis. When this connection is realized, it is plain that in dealing with hibernation forms of insects we are dealing with one of the most difficult problems in biology. No attempt will be made here to solve the difficulty, but, perhaps, the presentation of a few facts regarding hibernation forms may be useful and interesting.

The members of the order *Orthoptera*, almost without exception, hibernate in the egg stage; the *Hemiptera* mainly in the egg, or adult condition; the *Neuroptera* as larvae; the *Lepidoptera* in the egg, larval, pupal, or adult condition; the *Coleoptera* as pupae or adults; the *Hymenoptera* as larvae or pupae; the *Diptera* as larvae, pupae, or adults.

According to the foregoing, it would appear that the insects that pass through an incomplete metamorphosis have but one, or at most two, forms of hibernation, while the insects which pass through a complete metamorphosis have several forms of hibernation.

When we remember that the modifications in the stages of metamorphosis are modifications in the form and functions of organs in adaptation to a changed environment, it becomes evident that the insect may winter over in any one of the four stages. That stage will be chosen which will suffer least by the change of environment. For example, in those forms whose larval existence is spent in semi-liquid decomposing matter, it would be practically disastrous for them to remain as larvae, when intense cold sets in and changes the condition of the medium. They are more likely to survive as pupae, or adults, in a dry medium.

With reference to metamorphosis, insects are divided into the *Hemimetabola*, or those with an incomplete metamorphosis, and the *Holometabola*, or those with a complete metamorphosis. In the former there is a gradual change from the larva to the perfect insect, while in the latter the insects pass through a resting pupal stage.

With regard to the stages of development, some of them show better adaptation to hibernation than others, although it is impossible at present to explain why some butterflies winter over in the adult state and others in the chrysalis; or why some flies winter over in the larval state, some in the pupal, and others in the adult.

Brief notes of the stages will be given here beginning with the Egg, dwelling chiefly on characters which enable the insect to hibernate.

The Eggs. Eggs of insects are protected by two coats or membranes, an inner *vitelline* membrane, and an outer *chorion*, composed of two layers. When eggs are laid in situations exposed to the weather and cold, the shell, or chorion, is very solid, and sometimes strengthened

by ribs and ridges. Within the coats of the egg are the yolk-mass and the germinal vesicle, which lies within the yolk-mass. The amount of yolk-mass is usually large, and it is claimed by Brauer that the eggs of insects which undergo incomplete metamorphosis contain relatively more yolk than those of insects with complete metamorphosis. As the germinal vesicle lies within the yolk, it is securely protected against changes of temperature and moisture, as the yolk is mainly composed of fat globules. The eggs of some insects possess remarkable vitality, such as those of the "Walking Stick," and *Bittacus*, which survive two or more years.

Naturally, then, we might expect to find some insects in all the Orders hibernating in the egg state. The following common forms winter as eggs :—

- Plant-lice (*Aphididae*).
- Tree-Hoopers (*Membracidae*).
- Leaf-Hoppers (*Jassidae*).
- Most Scale Insects (*Coccidae*).
- Leaf-bugs (*Capsidae*).
- Grass-hoppers (*Acrididae*).
- Locusts (*Locustidae*).
- Crickets (*Gryllidae*).
- Walking-Sticks (*Phasmidae*).
- Gipsy Moths (*Ocneria dispar*).
- Fall Canker Worm (*Palaeacrita pometaria*).
- Tussock Moth (*Orgyia leucostigma*).
- Tent-Caterpillars (*Climacampa Americana*, and *C. disstria*)

(fig. 33).



Fig. 33. Egg-cluster of Tent Caterpillar.

The Larvae. Insect larvae differ from the immature forms of other invertebrates in the possession of the systems of organs and the same number of segments in the head, thoax, and abdomen. When ready to pupate the larvae are always larger than the adults.

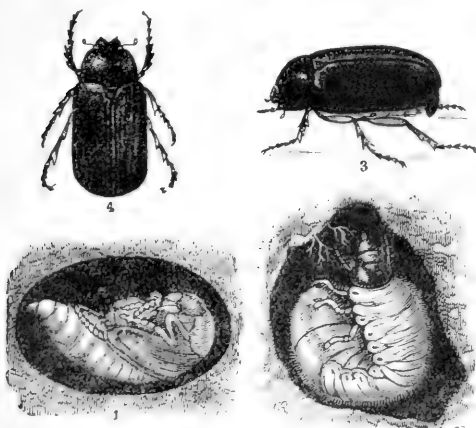


Fig. 36. *Lachnosterna*. 1. Pupa; 2. "White Grub"; 3 and 4. Beetle.

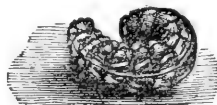


Fig. 34. Cut-Worm.



Fig. 35. Wire-Worms.

From the fact that the larval stage is the growing time of the insect it is not to be expected that hibernating larvae will often occur. Moreover, the relatively large amount of fluids within the body of the larvae, and the thin dermis just after moulting, make them extremely sensitive and liable to injury from freezing and other temperature changes.

Some insects, however, do hibernate as larvæ, but these are all protected in the ground, and in the mud at the bottom of ponds, or in specially constructed cocoons, or other covering. The following insects hibernate as larvæ :

Codling Worm (*Carpocapsa pomonella*).

Bud-Moth Caterpillar (*Tmetocera ocellana*).

Most Cut-Worms (*Noctuidæ*), Fig. 34.

Peach-Tree Borer (*Sannina eritiosa*).

Blister-Beetles (*Epicauta Pennsylvanica* *E. vittata*, *E. cinerea*).

Joint-Worms (*Isosoma tritici*).

Hessian Fly (*Cecidomyia destructor*), as "Flax-seed."

Ichneumon-Fly (*Ichneumonidæ*).

Ant-Lions (*Hemerobiidæ*).

Wire-Worms (*Elateridæ*), Fig. 35.

White Grubs (*Lachnosterna fusca*), Fig. 36.

San José Scale (*Aspidiotus perniciosus*).

Crambus Moth (*Crambidæ*).

The Pupa. True pupæ only occur among insects which undergo complete metamorphosis. As the pupal period is the resting, inactive stage, when no food is taken, and when the pupa

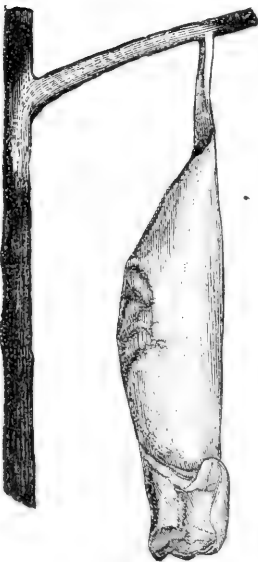


Fig. 27. *Attacus promethea* cocoon.

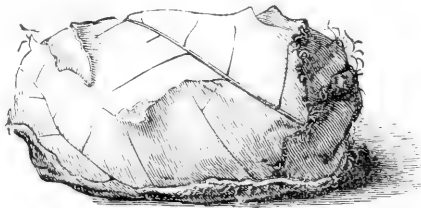


Fig. 28. *Telea polyphemus* cocoon.

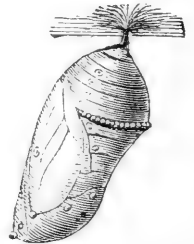


Fig. 41. Chrysalis of Milkweed Butterfly (*Archippus*).

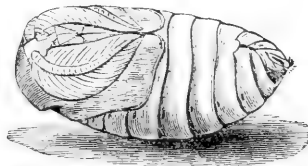


Fig. 39. *Telea polyphemus* chrysalis from interior of cocoon.

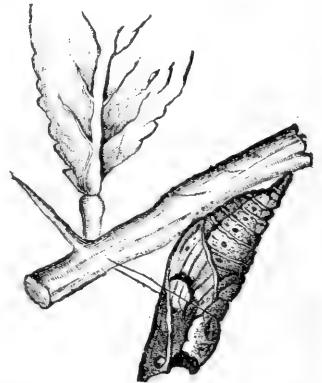


Fig. 42. Chrysalis of *Papilio Cresphontes*, showing mode of suspension.

itself is protected by a thick, chitinous, impervious coat, by a thickly-clad silk cocoon, or by an earthen cell in the ground, the majority of insects usually pass the winter in this stage. In this stage, the circulation and respiration is much lessened, while the supply of fat stored up by the larvæ is sufficient for the needs of the pupa.

It is interesting to study the pupal forms of insects, with reference to their adaptations to their surroundings. When pupæ are incased within cocoons (Figs. 37, 38, 39) or earthen cells (Fig. 36) they are smooth and rounded, but when chrysalids are formed, such as is the case with butterflies, and when there is considerable exposure to wind and weather, they are rough and angular (Fig. 40 *b*). The chrysalids of the Nymphalidæ, to which the Milk-Weed Butterfly belongs (Fig. 41), are all suspended by means of a button of silk to the under surface of some object, and they swing freely. It is plain that the "horny tubercles and roughened, calloused ridges" of such chrysalids protect the swaying bodies. The chrysalids of the Papilionidæ (Fig. 42),

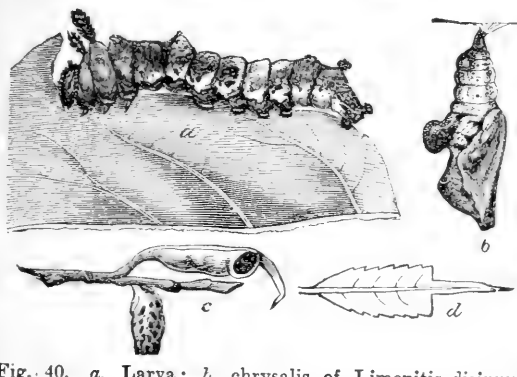


Fig. 40. *a*, Larva; *b*, chrysalis of *Limenitis disippus* butterfly, showing angulations and mode of suspension.

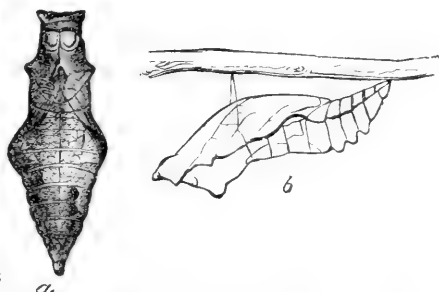


Fig. 43. Chrysalis of *Papilio philenor*. *a*, Back view, showing angulations; *b*, side view, showing mode of suspension.

to which our Swallow-tails and Cabbage-butterfly belong, are held in place both by a button of silk and by a girdle of the same material, which passes around the middle of the chrysalis.

Among the common insects which hibernate as pupæ are :

The Sphinges (*Sphingidæ*).

Cabbage-butterflies (*Pieris rapæ*).

Cecropia (*Samia cecropia*).

Polyphemus (*Telega polyphemus*).

Corn-Worm (*Heliothis armiger*).

Army-Worm (*Leucania unipuncta*)

Datana ministra.

Spring Canker-Worm (*Palaucrita vernata*).

Pea and Bean Weevils (*Bruchus pisi*, *B. obtectus*)

Squash-Borers (*Melittia ceto*).

Potato Beetle (*Doryphora decemlineata*).

Saw-flies (*Tenthredinidæ*).

Phorbia.

Oberca bimaculata.

Pear Midge (*Diplosis pyrirora*).

Clover-seed Midge (*Cecidomyia leguminicola*).

The Adults. Many insects in their adult condition are strongly chitinized and otherwise protected against wind, cold and rain. Such forms are well able to hibernate, more especially in the dormant condition. Among common forms are :

Grape-vine Flea-beetle (*Haltica chalybea*)

Plum Curculio (*Conotrachelus nenuphar*)

Potato-stalk Borer (*Trichobaris 3—notata*)

Asparagus Beetles (*Crioceris asparagi* and *C. 12-punctata*), Figs. 16, 19.

Potato Beetles

Cucumber Beetles (*Diabrotica vittata*, *D. 12-punctata*), Figs. 44, 45.

Buffalo Carpet Beetles (*Anthrenus scrophulariae*)

Bark Beetles (*Scolytidae*)

Squash-bugs (*Anasa tristis*)

Lace-Bugs (*Tingitidae*)

Chinch-bugs (*Lygaeidae*)

Stink-bugs (*Pentatomidae*)

Pear-tree Psylla (*Psylla pyricola*)

Leaf-Hoppers (*Jassidae*)

Green-fruit Worm (*Xylina*)

Mourning Cloak Butterfly (*Vanessa antiopa*)

Army Worm (*Leucania unipuncta*)



Fig. 44. *Diabrotica vittata*.



Fig. 45. *Diabrotica 12-punctata*.

The more the question of hibernation forms is studied, the more difficult it seems to account for the great number of variations; at the same time it becomes apparent that the particular form assumed during winter can only be determined by a study of the phylogeny of the insect. All Zoologists are not agreed as to the probable habitat of the primitive insects, but the bulk of the evidence points to them as land-dwellers and not water-dwellers. That the primitive adult insects were wingless and like the larvae is also conceded. They were ametabolic, that is, undergoing no metamorphosis. Our Thysanurans are supposed by some Zoologists to reveal many of the characters of the primitive insects. They live in damp places, under stones and rubbish, and are protected by these objects during winter, and there is no need for any special hibernation form. We can readily imagine, however, that as the numbers of the primitive insects increased, a "struggle for existence" would arise, and natural selection would choose out those forms that by accident, or otherwise, adapted themselves to changed conditions, either on land, in the air, or in the water. Tracheal gills of aquatic larvae may be regarded as an adaptation to an aquatic condition, and wings as an adaptation to an aerial existence. When insects possessed wings, environmental changes would be great and there would arise the necessity for a "Division of Labor" on account of the difficulty in securing food during the winter season. The larval stage was devoted to the acquiring of food, and to growth, and the adult to reproduction. Then came the pupal stage, as an act of necessity, to bridge over the gap between larva and adult, when preparations could be made for the complete formation of the adult. According to this, the pupa would be the normal hibernation form for most insects in our latitude.

ANOSIA ARCHIPPUS DOES NOT HIBERNATE.

BY J. ALSTON MOFFAT, LONDON, ONT.

The method of explaining the unobserved portions of the life history of *Anosia Archippus* by analogy, or bringing them into conformity with what was known in the life history of other butterflies, has retarded rather than assisted in removing the difficulties connected with it. There are several peculiarities in the life history of that butterfly which have been often enough observed to place them amongst the established laws of its nature, that are so different from anything known in the life of other butterflies, that it becomes necessary to seek an explanation of the unobserved portions of its history, in accordance with what is known in its own life rather than in the life history of other butterflies.

For instance, it does not pass the winter in the mature state in this locality. Nor can it survive it in any of the stages of its existence in its northern breeding grounds; hence after

each succeeding winter these regions where it is produced in the greatest abundance have to be replenished in the spring by individuals coming from the south. (Using these geographical terms in an undefined manner). Its noticeable habit of congregating in immense swarms in the north at the end of summer, combined with their utter disregard for each other sexually, whilst closely associated with each other individually for so long a time, is without a parallel in any other known species and therefore has a special significance of its own. Then the fact that these swarms move off together on the approach of winter, as if by mutual understanding, in a southerly direction, combined with the fact that similar swarms have been observed on more than one occasion wintering in the south, where such multitudes could not have been bred on account of the scarcity of their food plant there, clearly indicates that they had come from the north where they are bred in such profusion. When I wrote my paper for the 31st annual Report of the Entomological Society of Ontario, 1900, although quite convinced that *Anosia Archippus* was not a hibernating butterfly, yet I could not produce the evidence necessary to sustain and justify my belief, so I sent a copy of that report to Dr. Thaxter with a note calling his attention to it, that he might have an opportunity of correcting any erroneous conclusions I had arrived at, if he thought necessary. In return I received a most genial acknowledgement from the doctor, from which I have the pleasure of copying the following statement which is connected with the subject in hand :

"About those *Archippus* butterflies I have a memorandum on the sketch which I made at Appalachicola [which was published in the *Canadian Entomologist*, vol. xii. (1880) page 38], Fig. 46 to the effect that it was drawn from nature January 3rd, 1873. If I remember rightly the butterflies did not begin to scatter till February and then many were seen in coitu."

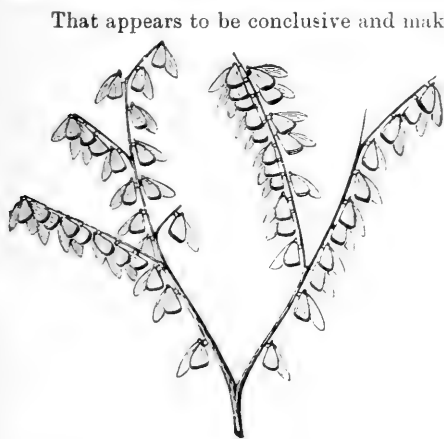


Fig. 46.

That appears to be conclusive and makes it certain that those flocks of *Archippus* butterflies seen by Dr. Thaxter in Florida (Fig. 46), were not there in search of a place to hibernate, but with the intention of passing the time in an active state until their season for breeding had arrived. The chain of evidence now seems to be complete, although every link in that chain has not yet been forged ; that those immense swarms that come together in the north where they were produced in such profusion, take their departure in flocks from the north for the very purpose of going south to winter there. Not always in a direct line but always tending in that direction, their movements are influenced by the nature of the route and the character of the weather. Not rushing impetuously onward to their destination as some butterflies are reported as doing, "*Entomologist's Record*," vol. xiii., page 98, but as becoming their regal character, deliberate and dignified in all their movements ; enjoying their journey and the novelties of the way ; having none of the distractions of family affairs to disturb their equanimity, being quite conscious that the serious business of their life is well off in the future and that in good time they will reach a suitable locality where they may spend the winter in comfort and safety.

Having thus obtained a satisfactory explanation of their autumnal gatherings in the north, as part of their constitutional habit of wintering in the south, one may regard that portion of *Archippus* life history as conclusively settled, and turn our attention to its spring movements, and enquire, when and from whence do the northerly migrations originate? In the absence of observed data we will have to be guided in the formation of our opinions on the subject, by the well known habits of the butterfly, and the climatic conditions of the localities it frequents.

Those swarms of *Archippus* that were seen wintering in Florida, probably reached that locality from somewhere in the north, about the end of November. They broke up in February and dispersed. Then, as is naturally to be expected, the sexual desires which had for so long lain dormant were aroused, and they prepared to carry out the purpose of their existence, namely, the multiplication of their kind. With that end in view they must first find *Asclepias* the food-plant of their progeny; reported to be always scarce in Florida, and in February probably no fresh plants of it to be seen there. Where then are they to obtain it? Certainly not by going northward at that time of the year, but by going still further south.

Prof. Riley as early as 1878 made observations upon southerly spring movements, but being confused with the hibernating theory he failed to realize their full significance. From an article in the "Scientific American" for April 6, 1878, a part of which he produced in the "American Entomologist," Volume III., Page 102, I copy the following that bears on the subject. After giving his view of their manner of spreading northward in the summer, and their flocking to the south in autumn, he says:

"We can thus understand how there are two, three or more broods in southerly regions, but only one toward British America. The exceptional flights noticed in the spring, and which, so far as recorded, take place quite early and in the same southerly direction, find a similar explanation. They may be looked upon as continuations of the autumn flights. Hibernating in the temperate belt, the butterflies are awakened and aroused upon the advent of spring, to find the milk-weeds not yet started, and they instinctively pass to more southern regions, where spring is more advanced."

Eliminating from that statement the hibernating idea, it is otherwise quite in accordance with what we know of the habits of the butterfly. Whilst the region of which Dr. Riley was speaking being Texas, Indian Territory and Kansas, where the autumn flocks would be gathered from a different part of the continent than those came from which were seen in Florida, their movements would be influenced by the character of that region, yet their natural disposition would remain the same, which is to move on and extend the species where ever it can find suitable conditions. Now the whole literature of the species testifies to its being a wanderer. Yet we know by its conduct in the north that it does not wander aimlessly. It seems to have a purpose and "a method in its madness" in that respect which looks wonderfully intelligent.

That habit being constitutional to the species, it will be found in some measure to influence every individual of it and control its movements to the utmost limits of its southern habitat on this continent, therefore, we are not warranted in restricting its northerly migratory movements in the spring to those individuals found in the more northern portions of its southern home. For those northern bred specimens that wintered there, when they have been aroused to activity by the approach of their breeding season, will move southward for we know not how far, depositing eggs as they go before they are exhausted, whilst at the same time, those born in extreme limits of its southern breeding grounds, impelled by that intense desire to travel and spread its kind will be moving northward. Thus migrations in opposite directions will be going on together; and it may yet be discovered, that the majestic sweep of that annual movement is far more extensive, regular and continuous than has ever been suspected.

On such considerations as these, in the absence of actual observations, we have to depend in forming our conclusions as to when, and from whence, the first arrivals in the north have their origin. Those that reach West Virginia about the end of March, would appear necessarily to come from somewhere much further south than Florida; whilst those that reach Ontario about the end of May, might be born there or thereabout. But so much depends upon the character of the seasons, and the directness or otherwise of the flight of the butterflies, that all positive conclusions must be withheld. The climate of Florida is not always favorable as a winter residence for the butterfly. Cold waves from the north descend upon it at times,

so as to destroy the orange groves, and a few years ago a frost in the South nearly exterminated the blue birds, and for years after scarcely one was to be seen in Ontario, and only now are they becoming common, and it may be years yet before they are as plentiful as formerly.

Now, *Archippus* is not likely to survive a frost that killed blue birds; yet no one in the north observed an unusual absence of *Archippus* in the following season, as was the case with the blue birds; and yet the probability is, that a wide belt along the South Atlantic States was swept clear of this particular butterfly during that winter. So we see that such a widely extended migratory movement is necessary to maintain the regular northern supply for propagating purposes in that region.

In regard to the number of broods in a season produced by the species in its tropical home, we are as yet without information. But, from what we know of its nature and habits, it seems as if it would require several to enable it to complete its annual functions. That it has no well defined broods in the north is certain, and the long continued straggling nature of its oviposition supplies us with the reason for it. (Scudder's "*Butterflies of Eastern U. S. and Canada*," Vol. I. page 742). And as it will follow the same course in the South, it will make it very difficult to determine the number of its broods there. That Mr. Edwards has seen them pairing in W. Va. is indicated by his remarks when dealing with the subject ("*Psyche*," Vol. II., page 169), which may be regarded as illustrating its habits in that locality, but that there would be as many broods in nature as he obtained in confinement does not seem probable; or that the butterflies bred there in nature would remain there to breed again is not at all likely, as it is not in accordance with its nature and habits to do so. I saw *Archippus* pairing on one occasion at Hamilton, in numbers, about the middle of June (Can. Ent., Vol. XX., p. 137). But singularly enough, it was the only instance of the kind that I ever witnessed; and that single instance cannot be regarded as exhibiting the regular habit of the species in that locality, but rather as an unusual and exceptional occurrence, for which there would be some special reason if we only could trace it. I do not now consider that those pairing individuals that I saw would be the first arrivals of the season for that year, but rather that they belonged to a brood produced in some less distant locality, but yet had travelled far before they were ready to mate, and would proceed yet further north in conformity with the established habits of the species.

The desire to travel, which is so strongly developed in *Anosia Archippus*, and which is so strikingly disclosed in its regular migrations on this continent, which constrains it as it were to turn its head northward in the spring, and southward in the autumn, and holds it as rigidly to these points of the compass until it reaches the furthest limits of favorable breeding conditions, is a faculty of direction which we do not yet comprehend. The migrations of birds will not assist us to unravel the mystery, as the old birds are supposed to guide the young ones on their first trip. The finding of their homes at long distances by cats, dogs and carrier pigeons does not apply, as in these instances it is with them a return journey; none of our butterflies were ever over that road before. Sight avails them not. Scent, as we know it, cannot assist them; and yet there may be an influence in the air affecting them that suggests both the time to start and the direction in which to go. We know that in some of the lower animals a particular sense can be found that is far more highly developed than the same one is in man. And we also know as a fact, although we cannot explain its operation, that there is in some of the lowest forms of life, where there is no nervous organization to receive an impression, a phenomenon termed "*Heliotropism*," signifying a turning towards the sun, which is as constant and certain in its operation as any other law of nature. Now, may there not be in these butterflies a sense perception of direction, of which we know nothing, but of whose presence they are perfectly conscious, and to whose promptings from without, they respond as readily as to their food, and which guides them as unerringly as in the choice of a food plant for their progeny? An influence in the atmosphere or from the sun, a kind of *Heliotropism*; or one that

seems to combine all others, and one which is getting to be more and more acknowledged as pervading and influencing everything. whilst uniting objects the most distant, and, as it were, obliterating space, but which has not yet, in this direction, found a place in the domain of science, namely,—electricity and magnetism? An influence which so acts upon their sensibilities as to prompt them to move in unison, at the proper time and in the right direction,—confidently, but unconcernedly as to cause or consequences?

COLLECTING AT LIGHT IN 1901.

By J. D. EVANS, TRENTON.

Early in June last the writer commenced collecting at an incandescent electric light which was continued every night with very few exceptions until about the middle of September; the light was outside and in front of the front porch; immediately below the light was fixed a funnel made of heavy white paper, and below and contiguous thereto was placed a deep glass jar containing cyanide of potassium. This would be placed in position at dusk and left out (except when rain threatened) all night.

On a favourable night myriads of insect life would be taken, caddis flies predominating, but always accompanied by a goodly percentage of moths, beetles flies, and bugs, with a few Hymenoptera. Upon the most unpromising nights 25 or 30 moths would be taken, which would increase to 100 or 150, or more, on a favourable night. The subdued light shed by the white paper seemed to have a peculiar attraction for the insects, for very few entered the house although windows were open and rooms well lighted.

Of the moths some species were taken in large numbers, particularly micros. Among the varieties may be mentioned *Plusia contexta*, and *P. striatella*; also *Xanthia togata* and a number of species not yet determined.

Among the Coleoptera many families were represented, and many species rarely met with were taken in large numbers, a list of which will be prepared at an early date. Among the families most numerous represented may be mentioned Carabidae, about 40 or 50 species, Hydrophilidae, Nitidulidae, Elateridae, Scarabaeidae, Cerambycidae, Chrysomelidae, and Anthicidae.

The Hemiptera were represented chiefly by fully 20 species of leaf-hoppers.

Very few insects were taken during the season other than by light.

I can record the capture of a fine specimen of *Papilio cresphontes* in the garden on the 20th August; it was hovering over a patch of Phlox Drummondii.

THE MILKWEED AT DUSK.

By ALBERT F. WINN, MONTREAL.

The attractiveness to insects of the flowers of the milkweed (*Asclepias cornuti*) has given rise to a new popular name of "Butterfly Weed" being applied to it. This name certainly appears appropriate enough to any one passing a patch of the plant in full bloom on a hot July day, with the blooms and the air around just alive with gay butterflies. But the entomologist wants something better than *Danaus archippus*, the various species of *Argynnis*, *Limnitis disippus*, and *Pamphilus*, when he has a day to spend in the fields, and if he spends much time around the milkweed he will probably come home with a great quantity of specimens of a dozen species of the commonest of our butterflies, which he will carefully put away in papers to remain there till doomsday.

I have often wished to have the opportunity of watching the milkweed blossoms regularly in the evenings, but till this summer have not had the chance. In July of this year I spent my

fortnight's vacation at Fortune's Rocks, near Biddeford, Maine, and the day after my arrival I came across a fine patch of milkweed in the centre of a hayfield, the plants flourishing there owing to the ground in this spot being higher than the rest and rocky, so the mowing machines failed to do their deadly work. The usual array of butterflies were eager to quench their thirst, and an occasional bee moth, *Hemaris thysbe*, darted about from flower to flower. Being close to the house where I was staying I felt that now was the chance to see whether the plants were not something else than "butterfly weeds," and on the evening of July 8th I sallied forth at about 7.15, armed with a net and two cyanide bottles. The first insect I saw was a big dragon fly busily engaged among the mosquitoes, which were exceedingly voracious. Nothing was on the blossoms but a few belated ichneumons and bees when I first arrived, but about 7.20 the *Heliothia pallens* and *adonea* appeared in perfect swarms, crawling all over the blooms. At 7.30 it began to be more like twilight and something dashed through the field and hovered near me over the plants. My first shot missed it, but it soon returned to another flower head and was captured—a *Sphinx gordius* (fig. 48). A moment later I had another of the same kind. Then a smaller dark fellow appeared, evidently a hawk moth, but new to me—*Dolba hylaenus* (fig. 47.) With this and the first *gordius* in one bottle, and the second *gordius* alive in the other, I was beginning to wonder what I should do if another *Sphinx* came along. It soon came in the shape of *S. kalmiae* (fig. 49), so I put the three previous captures in one bottle and the *kalmiae* in the other, when another *kalmiae* hovered right in front of me, but before I struck at it I noticed a few steps further on another *Dolba hylaenus*, and thinking this too great a prize to miss on account of a *kalmiae*, I made a stroke through the plant and to my surprise found I had not only the *Dolba* but two *S. gordius* as well. Didn't the scales fly from their wings? By this time the patch was simply alive with Sphingidae, and having filled both bottles I returned to the house, but found most of the specimens had suffered through being put into too small a space while alive. I should have known better, but one who has been accustomed to catching perhaps a dozen Sphingidae in a season is not likely to abstain from catching as many as possible when occasion arises, therefore any one knowing of an isolated patch of milkweed in full bloom during the flying season of the Sphingidae should go prepared.

The following evening seemed even more favorable, and I took my whole stock of bottles, four in number, a tin box charged with cyanide, and a box with cotton wool in it,—and Mrs. Winn accompanied me with another net. As on the previous night it was about 7.30 before any Sphingidae showed up, about half a dozen *Dolba hylaenus* arriving simultaneously, then *Sphinx gordius*, these two being always first—perhaps because there were more of them. A *S. Kalmiae* then flew over the patch without settling down, and with a sudden raising of the wings of one side darted across the field again, only to return in a few seconds. The eye could easily follow this species in the partial light owing to the light brown color, and they were noticeably shy till it became almost dark, perhaps instinct taught them that their colors were not a protection while hovering over flowers and dark leaves, though what enemies they have other than human beings I do not know. We used the bottles one after the other, and when No. 4 was occupied the *Sphinx* in No. 1 was transferred to the cyanide box in case there might be any life left in him; then No. 2 into the box, and so on. Even then we could not kill them half quickly enough—and every minute some new kinds seemed to be appearing. *Philampelus achemon*, *Sphinx drupiferarum*, *Deilephila lineata*, *Darapsa chorilus* and *myron* were plentiful, and a single *Sphinx luscitiosa*. There were so many specimens on the same head of flowers that it was difficult to pick out a particular one from among the humming throng. We soon found that making a stroke upwards was the only way to catch one at a time, a stroke through the blooms or downward over it meant at least a dozen—and pandemonium.

We soon got acquainted with the habits and appearance of the different species—the little *Dolba hylaenus* being easily noticed by its small size and dark color and keeping mostly to the

edges of the patch—*gordius* looking nearly black and twice the size of *hylaëus*—*drupiferarum* in turn seemed blacker still, the pale costa making it conspicuous—*S. kalmiae* was quite unmistakable in its flight from flower to flower on account of its color—*Darapsa myron* and *choerilus* were easily picked out by their small size and different flight, and they even settled on the blossoms—the large bodied *Philampelus achemon* and *pandorus* were also as easily recognized in the semi-darkness as in a glass covered cabinet drawer.

Our second evening resulted in our bringing home over forty specimens, belonging to ten species of hawk moths.

I shall not take up more time with details of further evenings spent at the same spot, but every visit was time well spent. Many interesting specimens among the smaller moths were captured. *Plusias*, *Hadenas*, *Heliophilus* and *Manestra* being in myriads some nights. On the last evening of my stay, July 20th, I caught only seven Sphingidae, but do not think their season

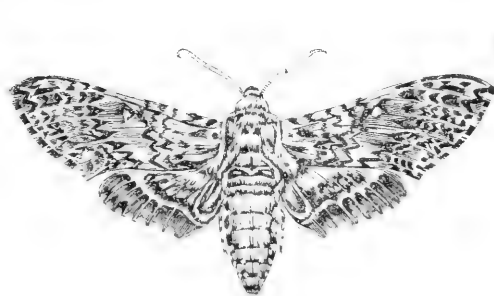


Fig. 47.—*Delba hylaëus*.

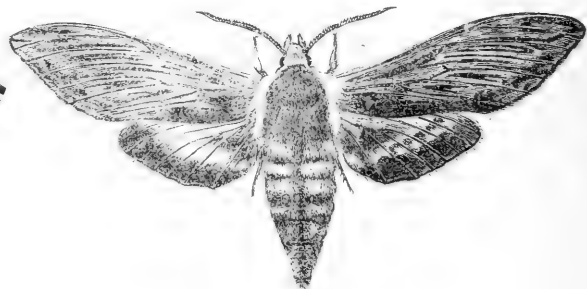


Fig. 48.—*Sphinx gordius*

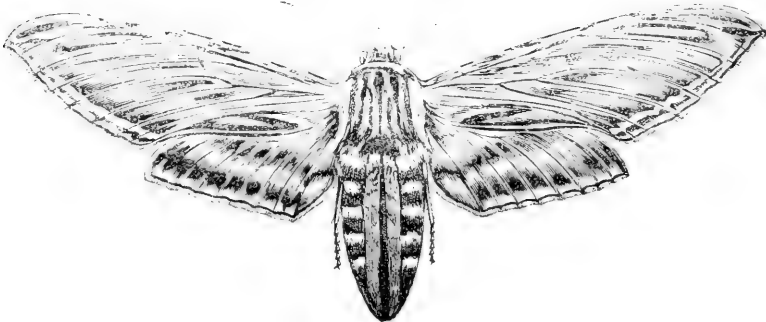


Fig. 49.—*Sphinx kalmiae*.

was over for I took these within a few minutes of my arrival, and a cold thick fog came up over the fields just before I left them and it is not unlikely that the insects felt it before I did.

For anyone fond of nature, it would not be easy to select a spot more interesting to spend an hour in, than that occupied by my milkweed patch—on its slight elevation, in the midst of hayfields, the sunset gradually fading away over the Maine Woods and the day-flying fauna disappearing to their resting places, to be replaced by a nocturnal fauna as invisible by day as the former is at night. The scent from the milkweed plant grows stronger as darkness sets in, the moths begin to flutter about, the whip-poor-will is heard on every side and the roar of the sea on the shore seems more soothing than by day.

We cannot all have the accompaniment of the ocean, but any entomologist who has not examined the milkweed blooms at dusk has a pleasure still to look forward to.

A COLLECTING TRIP IN SOUTH-WESTERN ONTARIO.

BY E. M. WALKER, TORONTO.

During August, 1901, the writer had the good fortune to accompany Prof. John Macoun, Naturalist to the Geological Survey of Canada, on a collecting trip in the South-Western peninsula of Ontario.

Prof. Macoun's investigations occupied the whole summer, from the latter part of May until the beginning of September, and collections of plants were made at a great many localities, covering practically the whole district.

The chief object which I had in view in making the trip was the collection of Orthoptera, as the region traversed was quite unexplored from this point of view. The time which I had at my disposal, however, was limited to the month of August, so that I was unable to visit localities enough to represent the entire district.

While most of my attention was given to the Orthoptera, I also collected a considerable number of Odonata and kept on the lookout for anything of special interest in the entomological or botanical line.

Our first stop was made at Leamington, a place not specially interesting in itself, but one from which several very profitable trips can be made. The chief of these is the trip to Point Pelee, the extreme end of which is some twelve miles distant from the town. It is a long sandy point, very narrow in its lower part, where it is largely covered with red cedar and juniper, but is somewhat wider in its upper part with sand dunes of some size on the west side, beyond which on the east are broad prairie-like flats of excellent wheat lands, formerly marshy. There are still marshes which will repay the collector in probably any branch of Insecta. The upper part of the point is beautifully wooded with magnificent walnuts, nettle-trees (*Celtis occidentalis*), basswood, cottonwood, etc., and a variety of oaks, with junipers in the more open places and near the beach; and many southern plants and insects are found there. I spent a day on the Point, and saw a *Papilio Ajar*, several of *P. Cresphontes*, any number of *P. Troilus* and captured a beautiful specimen of *Limenitis Ursula*.

Along the roads leading from Leamington to the Point *Papilio troilus* and *asterias*, especially the former were present in astonishing numbers. The presence of the former is what one would expect from the large number of Sassafras trees in the locality.

The bordered skipper (*Ancyloxypha numitor*) was present in great numbers along every roadside ditch and many specimens of another southern skipper (*Pholisora Catullus*) were also seen. The tobacco-worm, *Phlegethontius Carolina* is common in this district on the leaves of the tobacco which is grown in large quantities and of good quality in this part of the province.

The Orthoptera were very interesting, the family *Locustidae* or green grasshoppers and katydids being abundantly represented in the large open marshes at the north end of the Point. In fact I found them to be very well represented everywhere throughout Southern Ontario, the group being on the whole a decidedly austral one. This fact will be appreciated when the number of species inhabiting Southern Ontario is compared with those of the Nipissing and Muskoka districts. I took about 21 species in southern Ontario, whereas in Muskoka there are but eight and in Nipissing probably not more than five, only one of which is truly characteristic of the north. Most of the 21 southern species are Ohio and Indiana forms, such as *Xiphidium Scudderi* and *nigroleurum*, *Orchelimum indianense*, *O. longipenne*, *Conocephalus nebrascensis*, etc.

One marsh, especially at Point Pelee, yielded a remarkable variety of forms within a comparatively small area. This was at the mouth of a small creek which emptied into the lake at the upper end of the Point. On either side of the creek was a growth of wild rice, so tall and vigorous that at a short distance it had much the appearance of a field of Indian corn, and beyond

this, where the ground was not quite so wet, was an extensive growth of rushes and sedge. It was in the sedge that the green grasshoppers were most abundant, but they were very difficult to capture since, when alarmed, most species of Locustidae, especially the smaller kinds, have the annoying habit of darting downwards into the sedge and then leaping rapidly from one stem to another until one has not the least idea where to look for them. Fortunately, however, most species are found in large numbers when their particular haunts are discovered.

In this marsh, and practically in one spot, I took no less than a dozen kinds of Locustidae alone, all but two of which are unrecorded from Canada. Of these, one of the most striking in appearance though the smallest in size, is *Xiphidium Scudderi*, a long-legged little hopper, brownish instead of the usual green color, with short wings, long antennae and an extraordinarily long straight oripositor, often twice as long as the body. *X. attenuatum*, of which I found a few specimens, seems to be merely a long-winged form of the same species. Another interesting addition to our fauna made at Point Pelee is *Scudderia Terensis*, a very large bright green form related to the well-known *S. curvicauda* but larger. It is one of the katydid tribe and has a wing expanse of fully three and three-quarters inches.

The most abundantly represented genus, however, was *Orchelimum*, six species being found. Now this is remarkable when it is remembered that from Toronto northward to Lake Superior only one species occurs and that a very common and widespread one, viz., *O. agile*. This, by the way, is the common meadow grasshopper, whose familiar song, the "jip, jip, jip, zee-e-e," is known to everyone.

The other families of Orthoptera did not yield so many new forms, but one of them taken in the same marsh as the one just described was wholly unexpected and has a very southern distribution. This is *Tryxalis brevicornis*, a slender green and brown Acridian, with a long conical head and short flattened antennae. Its distribution as hitherto known is from Indiana and Long Id. to Honduras and Brazil, its occurrence in Indiana having been considered as unusually far north. I got but two specimens, both males, in good condition.

Another trip which we took from Leamington was to Arner, a village a few miles west of Kingsville. There were large open marshes here also, but although apparently very similar to those of Point Pelee, both the flora and insect fauna were in many respects different, some species common at Arner being entirely absent from the Point and vice versa. For example, not a single specimen of *Paroxya floridana* was seen at Point Pelee though very common at Arner, and *Orchelimum Bruneri* was very common at Point Pelee, but none were seen at Arner. This was in fact the only locality visited during the present trip where the first named species was found. It is a pretty brightly colored grasshopper with blue hind tibiae and is characteristic of the Eastern States from southern New England and Indiana to Florida, not having been taken in Canada before.

Another very interesting form taken at Arner which must not be overlooked is *Atlanticus pachymerus*, belonging to the Decticinae, a group of Locustidae, characteristic of the western half of North America, *Atlanticus* being the only eastern genus. It is a large, clumsy, brown, cricket-like form, the female quite devoid of either tegmina or wings, though the male has retained the tegmina as organs of stridulation. The thorax is very large and shield-like, and this feature has given the insect the name of the shield-back grasshopper. It is found in ravines and wooded hill-sides, but I came across it only at Arner.

From Leamington we went to Sarnia but on the way we stopped for five hours at Chatham and went for a tramp along the Thames embankment. Here the flora was quite unique in character and of great luxuriance and vigor, the nettles and Jerusalem artichokes towering far above our heads. The Professor pointed out several prairie species there, not found elsewhere in the Province, and it is his belief that this section was once prairie. It certainly would appear so to

judge by the presence of these typically prairie plants and the general perfectly level appearance of the country.

At Sarnia there is a great deal to interest the entomologist and Prof. Macoun found a great number of plants not recorded from Canada, among which was a grass new to science. The most striking thing in the insect line was the abundance of *Papilio Cresphontes*. Any number could have been taken but I had no space in either my bottles or boxes for anything but Orthoptera and dragon-flies. Another interesting butterfly found here and both at Chatham and Leamington was *Pieris protodice*. At the two latter places it is the common white butterfly, *rapae* being only occasionally seen. At Sarnia both are common but *protodice* is much the more predominant, while further north only *rapae* is seen.

This re-appearance of *P. protodice* after its apparent replacement by *P. rapae* strikes one as being quite remarkable, and it seems to confirm Mr. Moffat's opinion, expressed in the Twenty-fifth Annual Report of the Entomological Society, p. 61. He refers to the rapidity with which this change was brought about and regards as very improbable the theory that the disappearance of *P. protodice* has resulted as a consequence of the struggle for existence and the survival of the fittest. Mr. Moffat's idea is, briefly, that the two forms are races of one species, which on being brought together have interbred; the result being the persistence of the characteristics of the stronger race, *rapae*, and the suppression of those of the weaker, *protodice*. But although *protodice* is weaker, its characters are such as have resulted from its particular environment, such as the climatic conditions and other external influences under which it lives; and hence these characters must inevitably reappear in time as these same forces are still at work. Mr. Moffat also noted the recent capture of a few specimens of *protodice* in the vicinity of London and expressed the opinion that it would be common again in time. That it is becoming so seems to be evident from what I have observed in Southern Ontario, whatever the explanation may be.

Of Orthoptera and Odonata a number of interesting things were taken. Most of these were captured in a large open stretch of meadow-land, which extends along the St. Clair River between the town and the southernmost point of Lake Huron, where the St. Clair River leaves it. This stretch of country is under water during the spring and early summer but was quite dry when I saw it in August, and portions of it were gorgeous with the purple spikes of *Liatris spicata*, the dense button-snakeroot, making one of the most brilliant floral displays I have ever seen. Several interesting things were found here, notably *Orphulella pelidna* and *Conocephalus nebrascensis* neither of which had been taken before in Canada, nor were they met with again during our trip. I also took specimens of the two beautiful dragonflies, *Celithemis eponina* and *C. elisa*, the former flying about for the most part near the river where the ground was still wet, the latter being commoner further inland.

Separating this stretch of meadow-land from the wide beach of the lake is a high ridge of sand dunes wooded mainly with oak, while west of the town of Sarnia is the cemetery, which is also sandy, being much like High Park in character. Both of these localities, especially the latter, will richly repay the efforts of the entomologist.

Before leaving Sarnia finally the Professor and I crossed the river to Port Huron and thence took the electric railway down the river to Algonac, where we hired an Indian boy to ferry us across to Walpole Id. This is a Canadian island of considerable size and has been set apart as an Indian Reserve. It is an excellent collecting-ground being for the most part occupied by woods or marshes. Here I saw a great many *Papilio Cresphontes*, *Limenitis disippus*, *Pieris protodice* and other butterflies sipping the moisture from the ground near the water's edge. The marshes yielded numbers of *Orchelimum longipenne*, a green grasshopper only one specimen of which was seen elsewhere, namely at Point Pelee. I was indeed much struck throughout the trip by the fact that these open marshes, though often apparently of the same character and not far distant from one another, may support faunas which are by no means identical, some species

found not at all or very sparingly in one marsh being common in another and vice versa. I was unable to discover the reason of this but I imagine that on closer examination the conditions would prove to be more different than was apparent at first sight, or that many of the insects found therein are very local.

From Sarnia we went by steamboat to Goderich, which town we did not find very interesting from a natural history standpoint, the country being entirely of a clayey character; so we contented ourselves with a single day's trip which was very unprofitable entomologically, the only thing of special interest which was taken being a specimen of *Cychrus Lecontei*, a rather rare carabid beetle.

Our next stopping place was Southampton, a locality which amply repaid both of us and one where a great variety of country is to be found close at hand. The shore, which at Goderich is a steep clay bank about 200 feet high, is again low and sandy, a magnificent beach which strongly recalled the sea shore extending for some miles on either side of the town.

The forest growth here is quite boreal in character; white spruce, white cedar and juniper (*Juniperus communis* and *J. sabina* var *procumbens*) being the prevailing trees on the sand dunes which form a ridge behind the beach. Back of this ridge a short distance south of the town is an extensive swamp, in which the orthopterous fauna was also of northern type.

The most interesting capture made here however was an Oedipodine, a new species of *Trimerotropis*, which was found flying about on the beach, having essentially the same habits as *T. maritima*, which is abundant on the beaches of the great lakes further south, extending a little above Sarnia and is also found on the North Atlantic seaboard. As soon as I observed this extensive beach at Southampton I thought of the probability that either *T. maritima* would be found there, and if so at a much more northern locality than hitherto reported, or that some other species would take its place. After considerable search the latter proved to be the case and the species which replaced *maritima*, though closely allied, differs from that species not only in structure and markings but also markedly in the character of the stridulation.

I did not find much else of particular interest at Southampton, but this was doubtless because I paid small attention to anything but Orthoptera and Odonata; but on general principles I should highly recommend the locality to entomologists who are studying the Ontario species of any group of insects, because I believe there are very few, if any, places of exactly the same character in the Province. I doubt if a wide and extensive beach is to be found anywhere north of Southampton, as the eastern shore of Lake Huron north of a point about ten miles above Southampton is, as far as I know, continuously rocky.

After spending a few days collecting at Southampton we hired a good sized fishing boat and spent a most delightful week on the lake between Southampton and a small town called Tobermory, a few miles from Cape Hurd on the Georgian Bay side. Our party included the Professor's assistant and two fishermen, besides ourselves, and the object we had in view was the examination of the east shore of the lake as far as the Cape and also a few of the islands.

We cooked our meals and slept on board, though at night we of course always put into some harbour, of which many fine examples are to be seen. At Tobermory, for instance, there is a beautiful harbour, about half a mile long, the shore of which at the town is perfectly vertical to a depth of about thirty feet below the surface and some three or four above, so that no wharf of any kind is necessary and large vessels can come up close to the shore.

A decidedly northern flora and fauna is to be met with in this peninsula, but Prof. Macoun says that half a mile or so inland these conditions give place to the ordinary hardwood forests, such as would be met with in any part of Ontario at that latitude. This northern climate is mainly due to its proximity to the cold lake, but another factor also contributes in some parts of the shore rendering the climatic conditions boreal in character. This occurs at certain points where the limestone is very low and flat and only just a little above the level of the lake. The

snow and ice in these places remain in the woods sometimes as late as June and in early summer the place is still very wet. Later on, however, it dries up and the rock is exposed or is very near the surface almost everywhere.

The soil on this peninsula is very scanty and on the low places near the shore the plants and insects are very few in number of species. The Professor said that the flora resembled that of Anticosti, but I did not notice much that was remarkable about the insects. A peculiar little *Catocala* was perhaps the most interesting thing taken. It is closely allied to *C. antinympha*, if, indeed, it be not a variety of that species, from which it differs in the much lighter and more distinctly marked fore wings.

Among the Orthoptera *Podisma variegata*, two long-winged males of *Melanoplus fasciatus*, a form of very rare occurrence, *M. islandicus* and *Scudderia pistillata* are perhaps noteworthy. The first named is a very interesting Acridian of the group Melanopli and belongs to an alpine and northern genus, being the only American species which is not alpine. Like many alpine insects it is perfectly apterous and is closely allied to *P. glacialis* of the White Mountains and Northern Ontario. I have also taken it at Lake Simcoe. It inhabits cool swamps, especially peat bogs. *Scudderia pistillata*, which was found not uncommonly on the peninsula and at Southampton, is our one characteristically northern Locustid. It was exceedingly abundant on one of the small islands.

Before leaving the subject of this locality there is one fact concerning it which is worthy of remark, and this, though a botanical one, would probably influence the insects too. Many flowers common to this region and southern Ontario (notably Point Pelee and Sarnia) were in bloom or going to seed at a time when the same plants in the south were in bud or only just beginning to bloom. Now, this state of affairs at first seems very extraordinary when we remember that the snow remains so late here and the climate is decidedly colder than in the south. The explanation lies in the fact that the plants are growing over limestone, which absorbs more heat than any other rock, and much more than the ordinary soil.

After our return to Southampton we spent a few more days there and then drove to Owen Sound, where the limestone forms a bold escarpment overlooking the city and offers new conditions to the collector of both plants and insects. Deep crevices extend far into the rock and from above one can look down these, often forty feet. Some rare ferns are found here, but I got but little that was of interest to the entomologist, though I fancy a coleopterist could have taken plenty of interesting things.

Another locality at Owen Sound which the collector should not overlook is the Patterson House Park, the property of Mr. Matthews, the proprietor of the Patterson House, which is one of the chief hotels at Owen Sound. The park is several miles long and follows a ravine, along the bottom of which a small creek runs. The woods are in a primitive condition and some of the trees, notably the cedars, are of enormous size. The chief thing of interest that I found there were specimens of *Calopteryx maculata*, a beautiful dragon-fly which, though very common in June, usually disappears late in July, my specimens having been taken on the last day of August, an unusually late date. The luxuriance and beauty of this ravine would, I am sure, make it an admirable collecting ground.

Owen Sound was the last spot visited by the writer before returning to Toronto, so that the trip was practically taken up in following the shores of Lake Erie and Huron from Point Pelee to Owen Sound.

In conclusion I should like to emphasize one point in connection with the collection of specimens on a trip such as the one which has been the subject of this sketch. Most collectors, as far as I have observed, look for those species only which are wanting in their collections or which are rare or otherwise interesting. This is a great mistake. Every species in the group which the collector is studying should be noted down in a book kept for that purpose, and if

the collector is not absolutely certain of the identity of the species, specimens should be taken. It is better, if possible, to take specimens of every species from each locality visited, though, of course, this is unnecessary in the case of some very common and easily recognized species. It is only in this way that an accurate idea can be obtained of the distribution of the species in a given locality, and the value of an accurate knowledge of zoological distribution can scarcely be overestimated.

CRICKETS.

BY REV. THOMAS W. FYLES, LEVIS, QUEBEC.

There are certain things which greatly excite the wonder of the Old Country visitor to Canada:—the piping of the tree-frogs in the Spring; the flash of the fire flies in the Summer; and the sibillations of Orthopterous insects in the Fall. Other sights and sounds may be new to him, but these intrude themselves so persistently upon his attention—there is so much of them in every case—that they never fail to make a deep impression upon his mind. When he walks out in a calm night of August or September, his ears are greeted with such a tweaking of banjos from the black-crickets, that he almost expects these *nigger* performers to start up a plantation song for his amusement. He thinks to himself, (we may suppose) that the solo of the “Cricket on the hearth” of English writers is a very poor performance, compared with this chorus of the Canadian crickets in the field.

The name cricket is one of those imitative, onomatopæic words, such as “wake-up,” “pee-wit,” “aye-aye,” etc.

In my first year in the country-parts of Canada—long, long ago now—I was riding home at midnight from a visit to sick friend. My road was a lonely one, leading through the valleys of the Brome Mountains. I amused myself by putting together the following lines, suggested by the surroundings:—

On either side the road are rugged hills,
 And leafy branches mingle overhead;
 O'er all, heaven's vast unclouded vault is spread,
 Which the round moon with silver radiance fills,
 The Gryllus chirrups; the Ecanthus shrills—
 Ten-thousand quavering notes around are blent—
 The shaken air itself seems sibilant—
 From every bush the constant burden trills.
 It is to us as an outlandish tongue—
 We hear it, and pass on, acquiring nought;
 We know not with what meanings it is fraught,
 What triumphs, hopes and fears in it are sung.
 To Him, who plann'd the Universe, alone
 Ascends the import of each several tone.

But things that make so much noise in the world, as the crickets make, are deserving of more than passing attention; and we may well spend a short time in looking into their structure, their habits and their history.

The crickets belong to the Orthoptera—Saltatoria or leaping straight-winged insects. The first in order of the Quebec species is,—

ÆCANTHUS NIVEUS, DEGEER. (THE TREE CRICKET.)

This is an elegant creature well deserving of notice ; it is a little fairy robed in white—a dweller in the blossoms.

The male *Æcanthus* (Fig. 24, page 48) has transparent wing-covers rounded at the extremity and strongly veined. It is the combined friction and vibration of these veined wings that produces the notes with which it serenades its mistress.

The female (Fig. 25) has narrower wing-covers less strongly marked. Like a modest damsel she holds her peace.

These insects have ample and delicate hind wings, and long filiform antennæ. Their hindmost feet have four joints each—one more than we find in those of other crickets.

The female has a short, stout ovipositor with which it pierces the twigs of fruit trees, raspberry-canies, etc., and deposits her eggs in the wounds (Fig. 26). The young larvæ appear at midsummer, and feed upon aphides and small fruit.

GRYLLOTALPA BOREALIS, BURMEISTER. (THE MOLE CRICKET.)

The prince of our Canadian crickets is the Mole Cricket. It is a rare insect with us ; but it is common in some parts of the United States. In places where it abounds it has been found mischievous. It burrows in the gardens, and eats the roots of newly planted vegetables. 1,400 full grown mole crickets were once found on a surface of two-fifths of an acre that had been planted with cabbages.*

Its disproportionately large front legs, its abbreviated wing covers, its pleated wings extending to points beyond these, and the long tags with which the body terminates give the mole cricket a strangely grotesque appearance.

The members first mentioned seemingly terminate in gauntleted hands with the fingers extended. But these seeming terminations are neither hands nor feet—they are the tibiae or shanks of the front legs of the insect. The small feet are attached to the outside of them. With these shanks the cricket delves, and tunnels, and scoops out the chamber destined to be the receptacle of its eggs. When not in use these tibiae are drawn back and protected by the femora.

The length of the mole-cricket is about an inch and a quarter. Its colour is light bay or fawn.†

Much of our information upon the habits of the mole-cricket is derived from the Rev. Gilbert White who wrote more than a hundred and twenty years ago. In his delightful "Natural History of Selborne", he tells us that a gardener mowing beside a canal, struck his scythe too deep, and pared away a sod, exposing a mole cricket's nest and the approaches to it. "The nest was the size of a moderate snuff-box, Within the secret nursery were deposited near a hundred eggs of a dirty yellow colour and enveloped in a tough skin."

In Rennie's "Insect Architecture", enlarged by Rev. J. G. Wood (Bell and Dalby, London, 1869.), p. 266, a cut of the mole-cricket's nest and eggs is given. From this illustration we should infer that the "tough skin" is not a sack enclosing the batch of eggs, but the skin of the eggs individually, for the eggs are represented as lying in an open pile on the floor of the chamber.

*Dr. Fletcher in 22nd Ann. Rep. Ent. Soc. of Ont., p. 89.

†Harris's Insects injurious to Vegetation, p. 149.



Fig. 50. Mole Cricket. rived from the Rev. Gilbert White who wrote more than a hundred and twenty years ago. In his delightful "Natural History of Selborne", he tells us that a gardener mowing beside a canal, struck his scythe too deep, and pared away a sod, exposing a mole cricket's nest and the approaches to it. "The nest was the size of a moderate snuff-box, Within the secret nursery were deposited near a hundred eggs of a dirty yellow colour and enveloped in a tough skin."

The English mole-cricket is *Gryllotalpa vulgaris* Latr. It is a larger insect than *G. borealis*.

Dr. Lintner in his "Sixth Report on the Insects of the State of New York," says of *G. borealis*;—"Our-mole cricket lives in the ground, usually in moist earth—often on the sides of ponds or small streams, where it burrows into the moist ground at a depth of from six to eight inches, by means of its front pair of legs which are admirably constructed for digging. Its eggs are laid in these galleries, in a tough sack, to the number of from two to three hundred, within the chamber scooped out for the purpose." Dr. Lintner does not say that he writes this from his own observation; and we are left somewhat in doubt as to whether the habits of our mole-cricket differ from those of the European, or whether Dr. Lintner's words, "in a tough sack" are a mistaken rendering of White's "enveloped in a tough skin", or again, whether Rennie or Wood drew merely from imagination. It would be well if some Southern entomologist would clear up this matter.

G. borealis is said to hibernate in the larval condition. The perfect insect appears in May or June. The female then lays her eggs which hatch in one month. She guards her young brood until they come to the second moult, for they have many enemies, among which may be reckoned various kinds of ground beetles.

In some parts of England the mole-cricket is called the "Eve-churr", because of its peculiar note; and Professor Scudder, in an article contributed to the 23rd Report of the Ent. Soc. of Ont., p. 63, compares the call of *G. borealis* to "a guttural sort of sound like grii or green, repeated in a trill indefinitely."

THE FIELD CRICKETS.

But the crickets with which we are most familiar are the common field-crickets. Of these we have, in the Province of Quebec, at least three easily distinguishable kinds, viz:—

Gryllus neglectus, Scudder.

Gryllus niger, Harris.

Nemobius vittatus, Harris.

The first-named is about two-thirds of an inch long, black, with a brown line along the deflexed border of each wing-cover.

G. niger is a smaller kind. It measures only about half an inch in length. It is jet black. The males are comical little fellows.

Nemobius vittatus is the smallest of the three. It measures only about four-tenths of an inch in length. It is of a dusky brown colour and has three black lines over the head, and a black line along each wing-cover.

Insects of these three kinds are found in great numbers around Quebec. Their notes are produced by stridulation. The wing-covers are slightly raised and the projecting veins of one are briskly grated upon those of the other. The males only produce the sound.

The females lay their eggs in the ground by means of their long ovipositors.

Harris thus speaks of the injuries done by crickets:—"Where crickets abound they do great injury to vegetation eating the most tender parts of plants, and even devouring roots and fruits whenever they can get them. Melons, squashes, and even potatoes are often eaten by them, and the quantity of grass that they destroy must be great, from the immense numbers of these insects which are sometimes seen in our meadows and fields." (Ins. inj. to Veg., p. 151).

The crickets, especially *G. neglectus*, are often troubled with that strange parasite the Hair-snake. The Vice-President of the Quebec branch of our Society observed five of these creatures wriggle away from a cricket that a gentleman had struck down with his walking-stick—they did not stay upon the order of their going. The puzzle is, how did they find their way in? This is a greater puzzle than that which perplexed King George III. The monarch—so the story runs—one day entered a farm house, where he was at the time unknown. The owner and his family

were just sitting down to dinner, and hospitably invited the respectable old gentleman, who had walked in, to partake of the meal. The King graciously accepted the invitation. Among the dishes served was one of boiled apple-dumplings. In due course the King took one of these upon his plate. He examined it with interest. He could see no marks of stitches, nor other sign of a junction in the crust; and, mentally giving up the riddle, he exclaimed "However did the apple get inside the dumpling?"

The hair-snake is certainly found inside the cricket curled round, like the spring of a bird-trap, under the skin of the insect. There it thrives, imbibing the juices of its host; but how it got there is as yet a mystery.

I have mentioned the ground beetles that feed upon the eggs and young of the crickets. Our largest Quebec species is the Copper-spot Ground-beetle, *Calosoma calidum* Fab. (Fig. 51). The beautiful metallic spots on the elytra of this handsome insect make it easy of recognition. We have other fine beetles of predaceous habits. Amongst them is *Carabus maander* Fisch., a brown beetle of elegant shape, and with elytra finely sculptured with raised lines and rows of oblong spots. This insect is not uncommon at Quebec, but is rare in other parts of the province. *Cychrus viduus* Dej., is another handsome beetle, purple in colour, with striated elytra, and a large cordate abdomen. This last named species is said to regard slugs and land-snails as high-class food. But,—



Fig. 51. The Copper spot Ground-beetle.

"Revenons à nos moutons."

GRYLLUS DOMESTICUS, LINN (the Domestic Cricket).

During the autumn months of this year a cricket enlivened my house with its nightly serenade. Its place of abode was amid the inequalities between the mantel and the brick-work of the kitchen fire-place; and its favourite position was to stand head downwards, with so much of its body protruded from beneath the mantel as would allow of the free play of its wing-covers. With these appendages constantly vibrating, and with its long antennæ moving backwards and forwards, as if to catch the slightest pulsations in the air that might tell of danger, it would remain for hours. It did not seem to be afraid of light. I could approach warily, lamp in hand, within a yard of it, and watch its motions; but on the slightest aggressive movement it would dart backward to its retreat. It was about eight lines in length of body, of an ochraceous colour with brown and white markings. The veins of the wing covers were brown. The antennæ, palpi, tarsi and abdominal appendages were of a dull yellow. The last named were fringed.

The call of the insect was kept up till the middle of October, when it gradually became fainter and at length ceased.

CEUTOPHILUS MACULATUS, DE GEER (the Wingless Cricket).

A few seasons ago I had the opportunity of watching a wingless cricket as it sent forth its shrill "chirrup." Its hindmost pair of legs were moved up and down rapidly and their spin shanks brought to bear upon the edges of the abdominal plates. The combined friction and vibration produced the notes. The movement reminded me of that of the "up-and-down saw" in an old fashioned saw-mill.

The insect is the *Ceutophilus maculatus* of De Geer, and comes in the Locustariidæ; but, as Harris calls it "the spotted, wingless cricket," and its call is a cricket's call, it seems fitting to speak of it here.

The creature can be easily recognized by its rounded back, its brown colour mottled or potted with yellow, and its lack of alar appendages.

It is from 6 to 8 lines in length of body, and it has remarkably long antennæ and hind limbs.

There are other creatures that help to swell the concert that in the autumn evenings so deeply impresses us with the sense of the abundance of insect life ; but those we have spoken of—with their violins, banjos, and tambours—are the strength of the musical company.

ERRATUM.

The Rev. Dr. Fyles drew attention to a printer's error on page 54 of the Thirty-first Annual Report, line 17 from the bottom, where the word "stainy" is printed in place of *satiny*.

NATURE STUDY LESSONS ON MOSQUITOES.

By PROF. W. LOCHHEAD, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

It is unnecessary to state that mosquitoes are interesting for more reasons than the purely scientific. Perhaps no other insect is so well known throughout the wide world, for savage as well as civilized man suffers from its bites. It tortures the Eskimo as much as it does the African or Venezuelan, and makes life almost unbearable at certain stages in the high Arctic regions.

The object of these lessons, however, is more to learn about its habits and life-history than to give information regarding the effects of its bite ; although this latter phase is being studied very closely by scientific men at the present time, for it has been proved that certain species of mosquitoes are able to inoculate man with the organisms of malaria.

The best time to study the life-history of the mosquito is in the summer when the "wrigglers" are abundant in stagnant bodies of water. If a large glass jar be nearly filled with water from pools in marshy places, from ditches where leaves have accumulated, or from exposed rain barrels, a supply of mosquitoes in different stages of development can usually be obtained, and kept conveniently under observation. It would be well to cover the jar with a net of muslin to prevent the escape of the winged mosquitoes as they emerge.

The Eggs. Sometimes curious boat-shaped masses of eggs (Fig 52a) may be seen floating on some stagnant water. These should be secured, and put in the glass jar. An egg-mass consists of 200 or 300 spindle-shaped eggs, glued together. It readily rises to the surface if pushed below, and is none the worse of the ducking. It is probable that very few persons have ever seen the female in the act of laying her eggs, but it is supposed that the operation is performed in the early morning hours just before sunrise. The eggs hatch in about twenty-four hours after they are laid. The young "wrigglers," or larvae, make their escape from the underside of the eggs, by the opening of a lid.

The Wrigglers or Larvae. A careful watch over the inhabitants of the glass-jar will show how the wrigglers act. If some of them can be found at rest at the surface, it will be seen that they float with the head downwards, and the end of the body at the surface. (Fig. 52c).

At the mouth two tufts of bristles are in ceaseless vibration, and produce a continuous current of water, in which minute creatures are brought within reach as food.

The upper end apparently divides into two branches ; one branch rises to the surface, the other branch, the true hind segment, and the larger branch, serves as a rudder. When a wriggler is disturbed it wriggles away, using the rudder to direct its course. It will be noticed, moreover, that the wrigglers make greater efforts in rising to the surface, than in sinking through the water. This shows that their bodies are heavier than water, and they must have some means of keeping themselves at the surface.

The branch (Fig. 52c) which rises to the surface is in reality the breathing tube of the wriggler. The upper end consists of a five-rayed rosette, which is spread out on the surface of

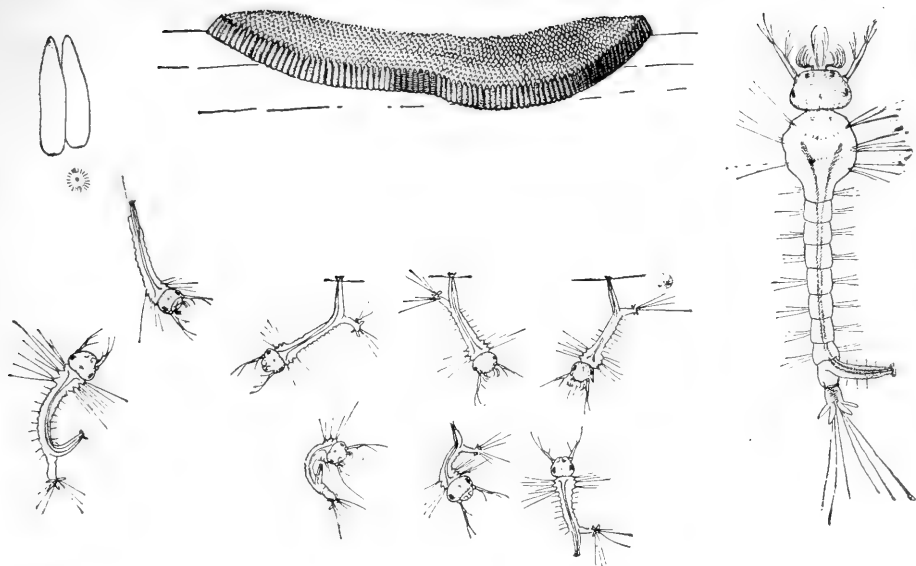


FIG. 52.—*Culex pungens* : Egg mass, *a*, with enlarged eggs at left, *b*, and young larvae below, *c*—enlarged. (From Howard, U. S. Department of Agriculture.)

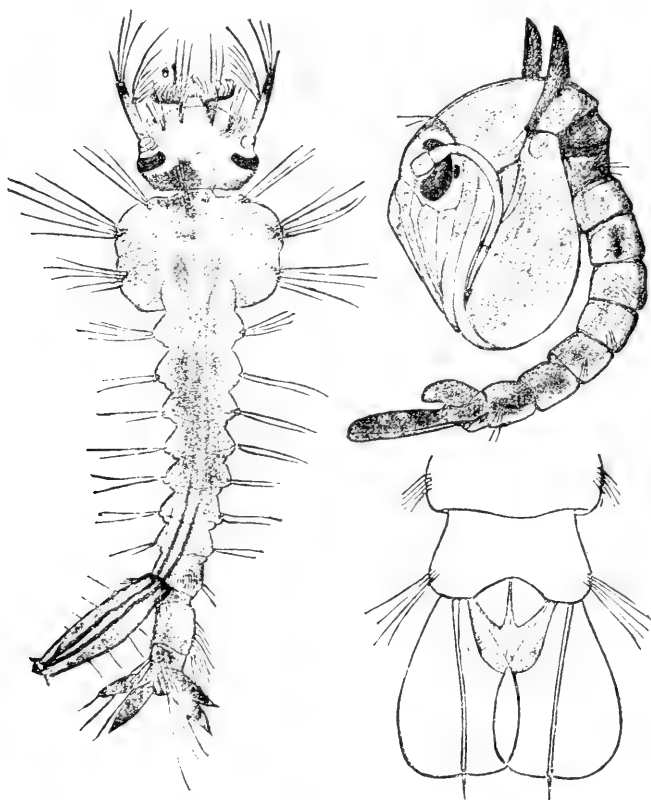


FIG. 53.—*Culex pungens* : Full grown larva at left, *a*, pupa at right, *b*—enlarged appendages of tail of pupa, *c*. (From Howard, U. S. Department of Agriculture.)

water. The tension of the surface film buoys up the rosette, and hence the wriggler itself. Through this breathing tube the insect, gets its supply of air. [Find out how long a wriggler can remain under water without coming to the surface for air.]

In nine or ten days, the wriggler assumes another shape—known as the *pupa*. [Determine how often the wriggler moults in this time.]

The Pupæ. They are considerably different in appearance from the true wrigglers. Their head-end is much enlarged (Fig. 53) and the insect is somewhat club-shaped. There is a difference also in their appearance when at rest. The head-end is at the surface, and the supply of air is taken in by two breathing tubes attached to the upper surface of the thorax portion of the enlarged end. Unlike most pupæ, the pupæ of the mosquitoes are active creatures, wriggling about in the water.

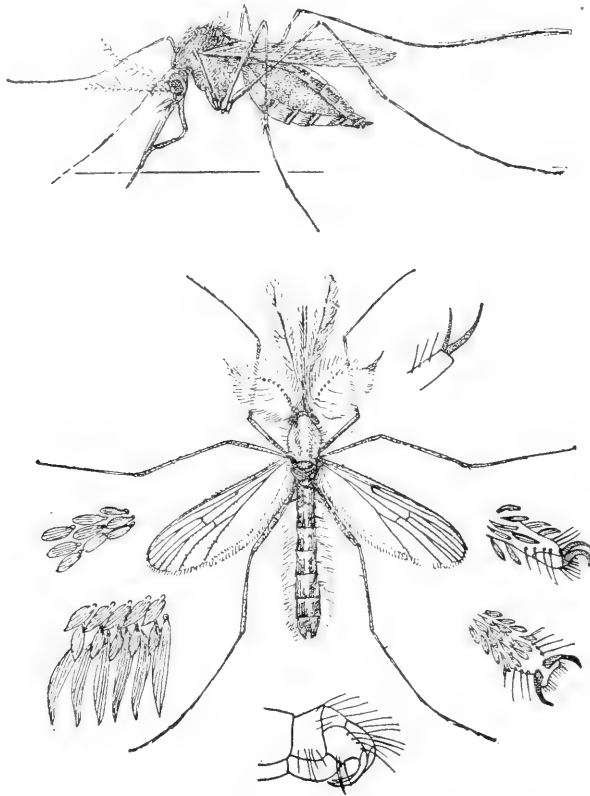


FIG. 54.—*Culex pungens*: Female above, male below,—enlarged. Scales on margin of wing; scales along veins of wing. (From Howard, U. S. Department of Agriculture.)

When a pupa-wriggler is disturbed, it becomes apparent that it makes greater exertions sinking than it does in rising. Its body, then, is lighter than water, and rests naturally at the surface without the aid of a special float.

During this stage, the mosquito develops the wings, legs, and the peculiar stinging mouth-parts, which are of such value to it in the adult stage. The rudiments of the wings and legs may be seen through the pupa-case, if a strong magnifying glass be used. In two or three days, the adult winged mosquito escapes from the pupa-case. (Fig. 54.)

The Adult Mosquitoes. When the time arrives for the emergence of the winged mosquito, the pupa-skin splits along the back, and the insect gradually raises itself on its long spindly legs using the old pupa-skin as a raft. It is nearly bent double as it pulls its wings out, but soon

these become filled, and it is ready to escape. If the wings should get wet during this delicate operation on the unsteady raft, it is more than likely that the poor mosquito perishes. A quiet body of water, therefore, is necessary for the safe emergence of mosquitoes in large numbers.

Male and Female Mosquitoes. The male mosquitoes are readily distinguished from the female by the long-feathered antennæ. The males neither sing nor bite, and if they feed at all it is on the juices and nectar of plants. It is quite probable that the normal food of these insects is the juices of plants, but it is also quite certain that the females delight in the warm blood of animals, including man.

The Wings. Mosquitoes have but one pair of wings. The margins of the wings are fringed with hairs, and the veins with minute scales. The buzz-sound of the mosquito is made by the rapid vibration of the wings, about 3000 in a minute, and by the air passing over little drums at the openings of the air tubes of the sides of the body. The hind wings are represented by a pair of stalked knots, called "balancers."

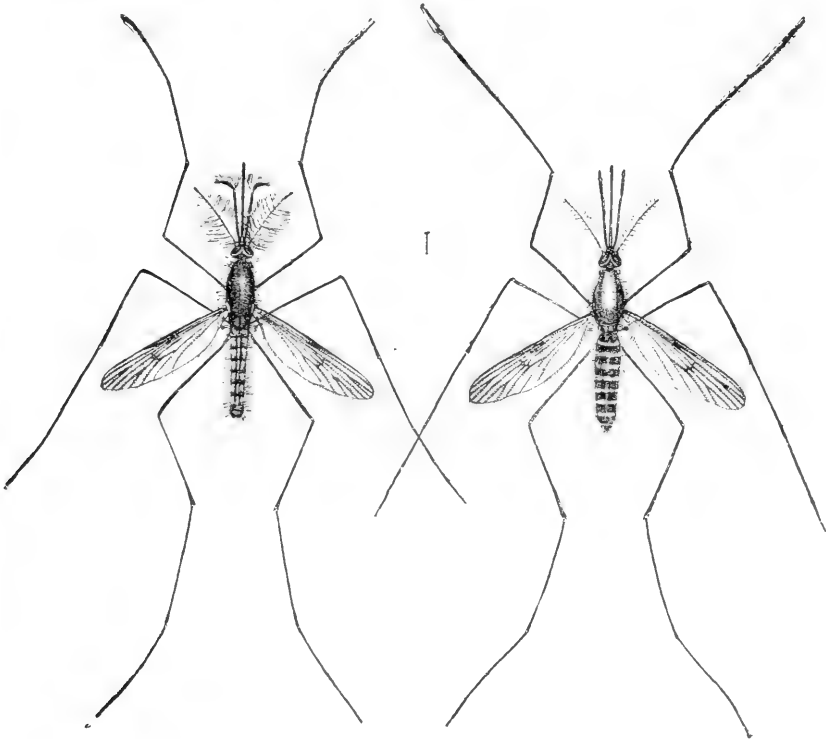


FIG. 55.—*Anopheles quadrimaculatus*: Adult; male at left, female at right—enlarged.
(From Howard, U. S. Department of Agriculture.)

The Mouth Parts. These are to many persons the most interesting portion of the anatomy of the mosquito. The mouth-parts of the males are simpler than those of the female, and consist of but three parts, the sucking proboscis and the two palpi, one on either side of the proboscis or sucking-tube.

The females have a long slender upper lip, five slender lances, and a large proboscis with two short palpi (Fig. 55). When a female mosquito alights on the skin, she pierces it with the

“bill” composed of the upper lip and the five slender lances, and the blood is drawn up through the proboscis into the stomach.

Kinds of Mosquitoes. There are several genera of Mosquitoes, two of which are common, viz., *Culex* and *Anopheles*. The former, however, is by far more abundant, and the species *pungens* is the *Common Mosquito*.

Anopheles is important as it is the agent in the inoculation of the human body by malaria. The female *Anopheles* may be distinguished readily from the female *Culex* by the length of the palpi on each side of the proboscis. In the former the palpi are almost as long as the proboscis, while in the latter they are quite short. (Fig. 55.)

The resting position of mosquitoes is an interesting study, which may be carried on both summer and winter. In winter the adults cling to the ceilings of attics and basements. [What is the characteristic resting attitude of *Culex* on the ceiling and the vertical wall?] (Fig. 56.)

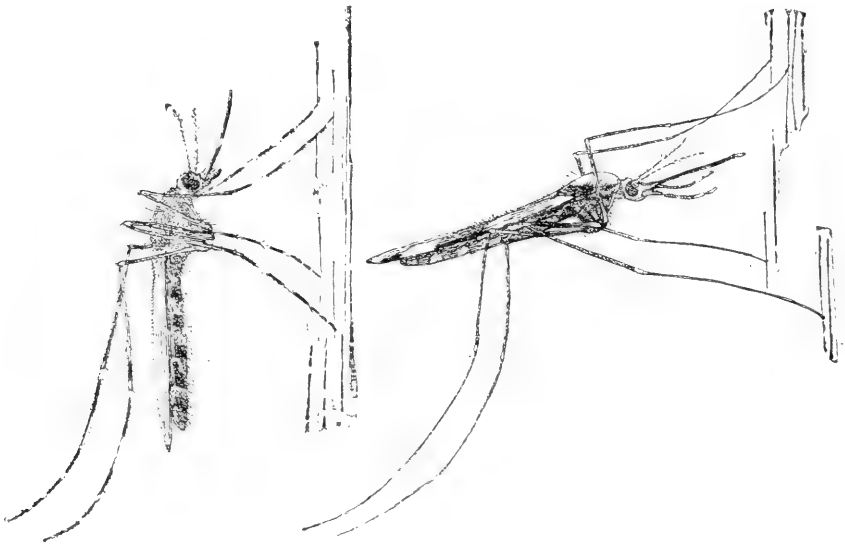


FIG. 56.—Resting positions of *Culex* (at left) and *Anopheles* (at right), enlarged (redrawn from a rough sketch published in the British Medical Journal. (From U. S. Department of Agriculture.)

How to rid a locality of Mosquitoes. Dr. Howard, of Washington, mentions three methods: 1. “By the drainage of the swamps or pools in which the mosquitoes breed.” 2. “By the use of kerosene on the surface of the waters in which they breed.” 3. “By the introduction of fish into fishless ponds so that they may eat the wrigglers.”

Practical Exercises.

1. How far do mosquitoes fly from their breeding places?
2. Collect a large number of mosquitoes during the summer, and determine, 1. the number of males, 2. the number belonging each to *Culex* and to *Anopheles*.
3. The effect of the use of Kerosene on the breeding places of mosquitoes (use 1 oz. for every 15 sq. ft. of surface).
4. Full-study of life-history of *Culex*.

ENTOMOLOGICAL RECORD, 1901.

BY DR. JAMES FLETCHER, OTTAWA.

Canadian students of Entomology, in the past, have had many obstacles to overcome before they could advance sufficiently in their studies to obtain that encouragement which is necessary to incite continued effort. Congenial companionship is undoubtedly the greatest and most useful help that any student can be blessed with in any line of research. It is manifestly of great advantage to know who is working at the same studies as ourselves and what others are doing, so as to correspond, compare notes and learn as soon as possible all that is to be known about any subject in which there is a mutual interest. We all know how the accidental capture of a rarity, or a chance incident, may direct our particular attention to some class of insects or some entomological problem which but for this accident might never have come before us.

Having for many years felt the want of this information, it has occurred to me that if there were published every year in the Annual Report a record of the important entomological events of the year, it would be of considerable use to every one interested in Canadian entomology. The plan of this Entomological Record may well, I think, be discussed by the members, and I shall be very glad to receive suggestions as to the most useful way of preparing it in future. The kind of information which it seems to the writer would be of use, will fall under the following heads:— (1) A record of special rarities taken by collectors, with the various localities and dates, which for ease of reference should be arranged under their natural orders and in the sequence of some recognised check list. (2) The names of specialists who have devoted particular attention to some order, genus, species, or phase of entomological study. (3) The names of any books of note affecting entomology, or connected with any branch of it, which may have been published during the year.

It is not proposed to include in this record, except perhaps in an incidental manner, facts connected with Practical Entomology. This subject will be fully treated of in "Notes of the Year" and other papers included in the Report.

The compilation and preparation of this Record need not always be done by the same person. I merely on this occasion submit a short outline or scheme, as a beginning, and, if my opinion as to its value is correct, I feel sure that year by year it will be improved in form. As soon as collectors and workers in entomology know that this will be a regular annual record, they will themselves send in notes of their work and requests for information, which will make it continuously more and more useful; indeed it will be better, that this record should not be always prepared by the same person when the final form in which it should be drawn up, has been decided upon, and I would suggest that at each annual meeting the council should request someone to undertake the work for the ensuing year, and then publish their choice, with the address of the compiler, in the "Canadian Entomologist" for January each year, so that collectors may know to whom records should be sent. These records of captures, or requests for information, should be sent in from time to time, and should not be held over until the end of the year, or there is great danger of their being forgotten.

Needless to say, every care must be taken that the identification of all species mentioned should be as accurate as possible, and doubtless considerable correspondence may be required and in some instances specimens may have to be examined; all this takes time, and will show how inconvenience may arise from records being sent in at a late date before the annual meeting.

In the meantime I shall be glad to receive notes on the above mentioned subjects, or advice as to improvements for the Record of 1902. The present article is merely suggestive—a beginning—and may be changed and improved to an unlimited degree.

THE SEASON OF 1901.

The season of 1901 in almost all parts of Canada has been characterised as "poor" by nearly all collectors heard from. Of those who have favoured me with notes, there are only two who have made satisfying collections, either as to species or as to numbers of specimens, viz. Mr. A. F. Winn, of Montreal, Que., and Mr. J. D. Evans, at Trenton, Ont. Such reports as "The poorest year I have ever known," "Remarkable for the absence of good species", "I never took so few good things", "Insects of all kinds scarce", etc., are almost universal. The only exceptions to this general statement in the reports received, were with regard to the unusual abundance in the West of *Pyrausta cardui* and *P. atalanta* and through the whole of Canada of *Pieris rapa*. In all parts of Ontario, the noticeable insect of the season was the Birch-Tree Skeletonizer (*Bucculatrix canadensisella*). In Manitoba and the North-west Territories the moths of *Noctua clandestina* were found during July in myriads inside houses, to which they had doubtless been attracted by lights.

LITERATURE.

Bibliographical notes on entomology appear regularly in all entomological journals and scientific magazines, such as "The Canadian Entomologist," "The Ottawa Naturalist," "Entomological News," "The American Naturalist," "Science," etc. These are all indispensable to the working entomologist.

Howard (L. O.)—"The Insect Book." An event of very great importance as affecting the whole subject of entomology is the recent publication of Dr. Howard's "Insect Book." Up to the present time, the one great obstacle in the way of lovers of natural history devoting their attention to the study of insects, was the fact that there was no single elementary work of moderate price, which would enable a beginner to identify and classify his captures. This want has been to a large measure supplied by Dr. Howard, with his most useful work. Copiously illustrated and written in untechnical language, it has already commended itself to a great many beginners, especially boys and girls, and will I feel confident, together with Dr. Holland's beautiful "Butterfly Book," do more to attract students to entomology as a recreation and study, than all the works which have preceded it. Beginners have now a starting point from which they can easily make an appreciable advance towards a knowledge of most of our common forms of insect life. The beetles and moths are now the only insects requiring treatment in the same manner, and it is to be sincerely hoped that before long this lack will also be supplied. Some deficiencies of minor importance, in the Insect Book, due to hurried publication, will doubtless disappear in the next edition.

Important monographic works will be dealt with under the Orders of insects to which they refer. Mention, however, may be made here of the splendid report by Prof. J. G. Needham, of Lake Forest University, Illinois, on the "Aquatic Insects of the Adirondacks," lately issued by Dr. E. P. Felt, State Entomologist of New York, a charming report of excellent and original work in an almost unworked field, and one which is very suggestive as to desiderata, with regard to which facts may be supplied by workers in all parts of the country. A valuable feature of this work, as in the Insect Book, is the number of suggestions which are made as to useful lines of work which may be taken up to supply unknown data in the lives of well known insects.

GENERAL COLLECTORS.

Most collectors of insects, as their material accumulates, specialize their efforts and devote their attention to one or two orders. There are a few, however, who keep up their general collections and who are always glad to correspond and exchange specimens in all orders. This, of

course, is the case with the curators of public institutions, such as museums, colleges and schools. In addition to these the following are active workers in Canada :

Begin, Rev. P. A., Sherbrooke, Que.	Gregson, Percy B., Waghorn, Alta.
Bethune, Rev. C. J. S., London, Ont.	Huard, Rev. Victor, Quebec, Que.
Coubeaux, Eugene, Prince Albert, Sask.	Lochhead, Prof. W., Guelph, Ont.
Desrochers, Rev. J. E., Rigaud, Que.	McIntosh, Wm., St. John, N. B.
Evans, J. D., Trenton, Ont.	Stevenson, Charles, Montreal, Que.
Fyles, Rev. Thos. W., Levis, Que.	

It will be noticed that most of the notes collected for this year's record are on the work of lepidoterists and coleopterists. A short report has kindly been prepared on Orthoptera by Mr. E. M. Walker, of Toronto, and data have been supplied for that on Hymenoptera, by Mr. W. H. Harrington, of Ottawa. Several collectors are devoting some attention to Diptera and Hemiptera, and it is hoped that by next year this material may provide data for a more extended notice of work in these orders, than is possible now. Canadian collectors are under deep obligations to the leading specialists in the United States, who at all times have most generously named material from all localities, whenever sent.

General collectors of insects frequently ask for a list covering all orders of insects, so that they may know how to arrange their collections. In most orders there is some one check list which is recognized generally ; this should be used in arranging a collection. Probably the best general list covering all orders is Dr. J. B. Smith's "Insects of New Jersey," which is a catalogue up to 1899, of all insects found in that State.

LEPIDOPTERA.

By far the largest number of notes received refer to the Lepidoptera. For that reason, on this occasion, these insects will receive first attention. Species are referred to, not always for their great rarity, but when it is thought that a note of the occurrence in a certain locality, or upon a certain date, may prove of interest to other collectors. The species are mentioned in the order of Dr. J. B. Smith's "List of the Lepidoptera of Boreal America," 1891. Of works relating especially to Lepidoptera which have appeared in 1901, first mention should be made of Mr. Beutenmüller's beautiful "Monograph of the Sesiidae of America North of Mexico," published as a Memoir of the American Museum of Natural History, with eight magnificent plates. By the same author is a very useful "Descriptive Catalogue of the Noctuidæ found within Fifty Miles of New York City." During the year several valuable articles containing descriptions of new species have appeared, by Prof. J. B. Smith, of New Jersey, and Dr. H. G. Dyar, of Washington.

The following list gives the names and addresses of some of the most active students of Lepidoptera in Canada. There are doubtless many others, but I have not been able to learn what they have been doing during 1901 :

Anderson, E. M., Victoria, B. C.	Heath, E. F., Cartwright, Man.
Bethune, Rev. C. J. S., London, Ont.	Johnston, James, Bartonville, Ont.
Boger, H. W. O., Brandon, Man.	Jones, W. A. Dashwood-, New Westminster, B.C.
Brainerd, Dwight, Montreal.	Lyman, H. H., Montreal.
Bush, A., Vancouver, B. C.	McIntosh, Wm., St. John, N. B.
Cockle, J. W., Kaslo, B. C.	Marmont, L. E., Rounthwaite, Man.
Criddle, Norman, Aweme, Man.	Moffat, J. Alston, London.
Danby, W. H., Rossland, B. C.	Norris, A. E., Montreal.
Dennis, A. J., Beulah, Man.	Richard, A. E., Ottawa.
Dod, F. H. Wolley-, Calgary, N. W. T.	Sandercock, W. C., Lauder, Man.
Evans, J. D., Trenton, Ont.	Suffield, J. D., Morden, Man.
Fyles, Rev. Thos. W., Levis, Que.	Taylor, Rev. G. W., Wellington, B.C.
Fletcher, James, Ottawa.	Venables, E. P., Vernon, B. C.
Gibson, Arthur, Ottawa.	Winn, A. F., Montreal.
Grant, C. E., Orillia, Ont.	Wilson, E., Vancouver, B.C.
Gregson, Percy B., Waghorn, Alta.	Wilson, T., Vancouver, B.C.
Hanham, A. W., Victoria, B. C.	Willing, T. N., Regina, Assa.
Harvey, R. V., Vancouver, B. C.	Young, C. H., Hurdman's Bridge, Ont.

Of the above named, the following have made specialties of some subjects: Messrs. Brainard, Cockle, Fyles, Fletcher, Gibson, Lyman and Young have given much attention to and are keenly interested in rearing species from the egg to the perfect insect. The Division of Entomology of the Experimental Farms is particularly interested in working out the life histories of insects, and will be grateful for all eggs or larvæ, which may be sent in by correspondents, particularly of Arctiidae, and also of Acronycta, Agrotids and diurnals.

There are now many more interested in the study of insects than was the case a few years ago, and naturally the members of our Society have taken an active part in bringing their favourite field of research before others. Excellent work has been done by Mr. H. H. Lyman, in Montreal, by the encouragement he has always given to the members of the Montreal branch. In this work he has been ably assisted by several of the other members, notably by Mr. A. F. Winn. Similar good work has been done in St. John, N.B., by Mr. Wm. McIntosh, in Quebec by the Rev. Thos. W. Fyles, and in Vancouver by Mr. R. V. Harvey. In London the Rev. C. J. S. Bethune has put new life into the local branch. Too much cannot be said of the courtesies of Mr. J. Alston Moffat, the efficient curator of the Society's collections, to whom all our active collectors are frequently under obligations in many ways. The Toronto Branch has, during the past year, made material progress in arranging the collection of insects presented by them to the Education Department for Ontario.

NOTES ON CAPTURES.

RHOPALOCERA. Melitoe harrisii, Scud. Fairly common in one locality at Orillia. (Grant.)

Phyciodes butesii, Reak. This species, which is much rarer than *P. tharos*, occurs at Ottawa and Aylmer, Que., a week or ten days sooner than the latter species. (Fletcher.)

Euptoieta claudia, Cram. A female of this species was taken at Regina on July 10, while in the act of laying its eggs on *Linum sulcatum*. Four eggs were seen to be deposited on separate plants, so that this flax, a curious food plant for an Argynnid, seems to be the natural food of the caterpillars in that district. It is also known to feed on violets, and has even been troublesome in gardens in the West from attacking pansies.

Grapta satyrus, Edwards. A fair specimen that had wintered. May 5, Orillia. (Grant.) This species is rare east of the Rockies, but very common on the Pacific coast.

Vanessa californica, Bdv. A few specimens. New Westminster. (Jones.) This butterfly is very seasonal in its appearance. It was reported as swarming in the mountains round Kaslo, B.C., by Mr. Cockle, last year. A few specimens high up on Mount Che-am in the middle of August, where it was very troublesome in disturbing more desirable species. (Fletcher.)

Junonia cænia, Hbn. A fairly good specimen in a cutting on the railway. Orillia. (Grant.)

Limenitis weidemeyerii, Edw. One or two specimens of this species were found in the collection of Mrs. Walton, at Armstrong, B.C., where she had collected them.

Debis portlandia, Fabr. A few specimens of this butterfly have been taken at Ottawa in 1901, July 10. (Richard.)

Erebia vidleri, Elwes. In addition to the six previously known examples of this fine species, about two dozen more were taken on the 15th and 16th August last on Mount Che-am, B.C., by the writer and Messrs. A. Bush and T. Wilson, of Vancouver.

Hipparchia ridingsii, Edw. Regina, July 10. (Fletcher.) This species has also been taken in some numbers at Aweme by Mr. Criddle.

Chionobas jutta, Hbn. Mer Bleue, near Ottawa, May 31. (Gibson.)

Thecla nelsoni, Bdv. Not uncommon at Kaslo in spring. (Cockle.) This is the first record of the species being found in Canada.

Chrysophanus xanthoides, Bdv. Brandon, Man. (Boger.) Several specimens.

Lycaena serpiolus, Bdv. This common western species seems to be gradually extending eastward. Four years ago a single specimen was taken at Nepigon. Last year in the beginning of July it simply swarmed in localities where in previous years, although visited at the same time of the year, no trace of it was seen. (Fletcher.)

Lycaena couperii, Grt. This species has never been recorded for western central Ontario, but Mr. A. W. Hanham writes that he took several specimens May 17, 1891, "two miles up from Brantford, close to the Grand River, via the Paris River road." Collectors in western Ontario should be on the lookout for the species.

Lycaena shasta, Edw. Some years ago Mr. F. H. Wolley-Dod took a single specimen 24 miles south of Calgary, but the species then disappeared. During the past summer he was fortunate enough to secure three or four more specimens. The locality seems rather far from the mountains for this species, and it is probably the farthest eastern limit in Canada. The altitude of Calgary is about 3,400 feet above the sea level.

Lycaena comyntas, Gdt. One specimen at Aylmer, Que., June 6, the second record only in the Ottawa district. (Gibson.)

Neophasia menapia, Feld. The mode of occurrence of this species in British Columbia is very remarkable. In certain years it swarms in countless myriads, the caterpillars feeding on the coast upon the foliage of the Douglas Spruce, but in the interior on the Bull Pine, *Pinus ponderosa*. Towards the end of the season, in August, the dead butterflies may be seen in vast numbers floating on the sea around Vancouver Island, or thrown up along the beach in wind-rows sometimes an inch or two in depth. A few specimens were seen flying in the Nicola valley on August 18 (Fletcher), and Mr. Dashwood-Jones reports that a few specimens were also taken at New Westminster.

Pieris protodice, B.-Lec. One specimen flying around golden-rods Sept. 21. The first record for Ottawa. (Fletcher.)

Colias eurytheme, Bdv. Remarkably abundant at Orillia. (Grant.) A few at Ottawa in September. (Young.)

Colias christina, Edw. Langvale, Man., June 5. (Sandercock.)

Pamphila hobomok, Harr. I have endeavored to hear of any instance of true *P. zabulon* being taken in Canada, but so far have failed. The differences between these two species are well shown by Dr. Skinner on plate 19, Entomological News, Vol. X. It would be well if Canadian collectors would examine their specimens and see if we have *P. zabulon* in Canada.

Eudamus bathyllus, S. & A. Three specimens of this butterfly, which differs from the somewhat similar *E. pylades*, Scud., by the absence of the sexual costal fold in the males, were taken by Mr. James Johnston at Hamilton, last year. Although frequently recorded from Canada, I believe that these are the first specimens which have been examined critically.

Pyrgus tessellata, Scud. A fine fresh specimen at Orillia Park, Sept. 21. (Grant.)

HETEROCERA.

Lepisesia ulalume, Strk. This rare and beautiful species has been taken several times at New Westminster by Mr. Dashwood-Jones. Mr. Harvey took a specimen this year at Vancouver. Whether it is a true species or merely a western representative form of *L. flavofasciata*, Barnst., requires investigation. Specimens of *ulalume* in some instances show very little of the black collar and have the secondaries more or less clouded with yellow. As a rule, the western form is larger than *flavofasciata*, but seems the same relation to it that *Nisoniades juvenalis* does to *N. propertius* of the West.

Sphinx canadensis, Bdv. Two fine specimens of this rare hawkmoth were taken at Ottawa, June 10 and 12. Mr. Gibson, the captor, recognizing them as different from anything he had seen before, even on the wing.

Ampelophaga versicolor, Harr. Montreal, July 14. (E. D. Wintle.)

Smerinthus cerisyi, Kirby. A beautiful specimen at light, Orillia, May 20. (Grant.)
Trenton. (Evans.) Rare in Eastern Canada.

Sannina exitiosa, Say. St. John, N. B. (McIntosh.) As no peaches are grown at St. John this record is interesting.

Alypia Mac-cullochii, Kirby. Montreal Island, June 1. (Stevenson). This is an interesting record. The species is common in the far East, whence it was described, also at Nepigon and in the Rocky Mountains. I have several times found the larvæ on *Epilobium angustifolium* at the latter localities and obtained the moths the following spring.

Heterocampa marthesia, Cram. A beautiful specimen of this fine moth was bred from a larva found on the ground in a beech wood at Ottawa during Sept. 1900. The moth appeared the following June. (Fletcher.)

Heterocampa biundata, Walk. A fine female was taken at light June 15, Ottawa. (Fletcher.)

Eacles imperialis, Dru. Two at light. "I never came across this till 1900." Orillia, June 24. (Grant.)

Hepialus sequoiplus, Behr. A fine specimen of this rare species was taken at Vancouver by Mr. E. Wilson; it has been previously taken at Victoria by Rev. G. W. Taylor.

Hepialus mustelinus, Pack. One specimen, St. John, N. B. (McIntosh.)

Euthyatira pudens, Gn. One at light, the peach-blossom tint very pronounced. May 2, Orillia. (Grant.)

Semiophora youngii, Sm. ms. This new species was reared from the larva and collected by Mr. Young last season. Mer Bleue, near Ottawa. Aug. to Sept. (Young.)

Peridroma astricta, Morr. Kaslo, B. C. (Cockle.) Mr. Cockle sent eggs to Ottawa under date July 30. The larvæ were full grown in October. Cartwright, Man. (Heath.) Specimens sent by Mr. McIntosh from St. John, N. B., were identical with the western form.

Noctua substriata, Sm. A fine specimen taken at Brandon. (Boger.)

Feltia robustior, Sm. A specimen of this newly described species was taken at Brandon. (Boger.)

Carneades quadridentata, G. & R. This species was recorded in Bull. 18; 1899, Nat. Hist. Soc. of N. B., by W. McIntosh (teste H. Strecker), "but the species has proved from better specimens submitted to Prof. J. B. Smith to be *C. detersa*. Three specimens were taken in 1901." (McIntosh). *C. detersa* is a widely distributed species and under the name of *C. pitychrous* is included in many lists.

Mamestra rugosa, Morr. Mer Bleue, near Ottawa, May 31. (Gibson.) A remarkably bright specimen, the first Ottawa record. Two specimens, St. John. (McIntosh.)

Carneades mollis, Wlk. (*C. fernaldi*.) Two or three specimens mid-July. (McIntosh.)

Homohadena badistriga, Grt. Several specimens bred from larvae found on honeysuckle. Ottawa. (Fletcher.)

Oncocnemis atrifasciata, Morr. A fine specimen of this beautiful moth, St. John, N. B. (McIntosh.) Rounthwaite, Man. (Marmont.)

Prodenia lineatella, Harv. Ottawa, October. (Fletcher.) Trenton. (Evans.)

Eupsephoctes procinctus, Grt. This fine noctuid (two or three specimens) was taken at "sugar" at Brandon, Man., by Mr. Hanham. Several specimens were bred by Messrs. T. Wilson and A. Bush, from troublesome cutworms feeding on vegetables in gardens at Vancouver, B. C., in company with *Peridroma saucia* in 1900.

Gortyna orata, Lyman, n. sp., described in Can. Ent. XXXIII, No. 12, p. 319.

Achatodes zea, Harr. Several specimens of this neat little moth were bred from caterpillars boring in the young shoots of elder, *Sambucus*. Kingston and Ottawa. Imagoes July 6. (Fletcher.)

Tæniocampa oviduca, Grt. Trenton, rare. (Evans.)

Scopelosoma devia, Grt. St. John, N. B. (McIntosh.) One specimen. Had previously been taken here once before, May 15, 1898.

Xylina thaxteri, Grt. One specimen Ottawa Apl. 23. (Young.)

Plusia thyatiroides, Gn. At light Aug. 24, Orillia. (Grant.) St. John. (McIntosh.)

Plusia dyans, Gat. At flowers in town park, Orillia, Oct. 10. (Grant.)

Plusia flagellum Walk. St. John, N. B. (McIntosh.)

Catocala elda, Behrens. A few specimens, New Westminster. (Jones.) Vancouver. (Bush.) This beautiful species which resembles the European *C. fraxini* much more than the American *C. relictæ*, of which it is supposed to be a variety, was bred by the Rev. G. W. Taylor many years ago from a larva found at Victoria on Oak.

Erebos odora, Linn. This strong-winged wanderer from the West Indies has this year been reported from as far west as Calgary, where a specimen was taken by Miss Moodie of that place. Last year Mr. Hanham secured one at Winnipeg, and Mr. Dennis another at Beulah, Man. Mr. Grant took a perfect female "at sugar" at Orillia, July 6.

Homoptera woodii, Grote. "A beauty, at sugar," June 10, Orillia. (Grant.)

Leucobrepheos middendorfi, Men. A pair of this rare and interesting moth taken at Aweme, Man., early in the spring, "extremely difficult to see and to follow." (Criddle.)

VARIETIES.

Argynnis lais, Edw. Some beautiful suffused varieties of this species have been taken at Aweme by Mr. Criddle, and during the past summer a handsome specimen somewhat resembling the figure of *A. platina* shown on plate 13, Ent. News, XII, No. 10, was taken at Beulah, Man., by Mr. Dennis. This specimen has three large basal silver blotches and a sub-marginal band of large silver spots. The primaries are more suffused with black than in the figure referred to. A fine painting of this and Mr. Criddle's own specimens were exhibited at the annual meeting.

Fanessa Antiopa, var. *Lintnerii*, Fitch. A fine specimen, with very wide border was this year bred at Ottawa, July 10th. This is not a true variety, but merely an accidental form which can be produced at will. (Fletcher.)

Lycæna neglecta, Edw. Mr. A. F. Winn caught last year at Bideford, Maine, on July 14th, a very fine gynandromorph of this species, the left side of which was female and the right male.

COLEOPTERA.

There are many who are collecting beetles in Canada, but, unfortunately, few records have been received, compared with those which have come to hand from lepidopterists.

The following are the names of some of the most active collectors:

Bethune, Rev. C. J. S., London, Ont.

Chagnon, Gus., Montreal, Que.

Crew, R. J., Toronto.

Evans, J. D., Trenton, Ont.

Fletcher, J., Ottawa, Ont.

Hanham, A. W., Victoria, B.C.

Harrington, W. H., Ottawa, Ont.

Keen, Rev. J. H. Metlakatla, B.C.

McIntosh, Wm., St. John, N.B.

Taylor, Rev. G. W., Wellington, B.C.

Mr. Keen has sent few records this year, but no one has done more to increase our knowledge of rare species from the extreme north-west coast than he has. He collected assiduously

for many years on the Queen Charlotte Islands, and has recently moved to his present address.

NOTES OF CAPTURES.

Cicindela limbata, Say. Reported by Mr. Hanham as found on the sand hills bordering the Douglas swamp, Man., on June 18, 1899. "They looked like large white spiders skimming over the sand. I found them copulating buried in the sand, with just their heads showing."

Cicindela pusilla, Say. This rare species was taken by Mr. L. E. Marmont, at Rounthwaite, Man., and also by Mr. Hanham, at Bird's Hill, near Winnipeg, in 1900.

Cychnus tuberculatus, Harr. This rare and handsome species is occasionally taken in Vancouver Island. Comox, B.C. (Taylor, Fletcher, and Prof. J. Macoun.) The Rev. J. H. Keen found it not uncommon at Massett, on Queen Charlotte Islands. Two fine specimens were taken at Coldstream, twelve miles from Victoria, in June last. (Hanham.) The food of beetles of the genus *Cychnus* is generally stated to be snails, but Mr. Hanham writes: "I have found *Cychnus angusticollis* and *C. marginatus* in colonies in rotten stumps evidently preying upon slugs, which were with them. I think, for every snail they get here, they get one hundred slugs. I have caught *C. marginatus* in my garden feeding on slugs."

Cychnus angulatus, Harr. This very rare species has been again taken on Vancouver Island by the Rev. G. W. Taylor. Superficially, it resembles the black form of *C. angusticollis*, but has the thorax differently shaped, and the punctuation and striation of the elytra are quite different. "Near Brennan Creek, July 1, I have only seen three in nineteen years." (Taylor.)

Carabus nemoralis, Mul. This interesting carab was first recorded by Dr. Horn as a Canadian species in 1891. Later in the same year Mr. Harrington took several specimens at St. John, N.B., associated with another European species, *C. granulatus*, Dej., and published a note in the Canadian Entomologist, 1891, p. 112. Mr. McIntosh now finds both of these species abundant at St. John, and speaks of *C. granulatus* as our commonest ground beetle.

Pasimachus elongatus, Lec., taken not uncommonly at Aweme. (Criddle.) Under stones in the Brandon Hills. (Hanham.)

Clivina pallida, Say. St. John, N.B., rare. (McIntosh.)

Dicelus sculptilis, Say. "This species was not uncommon in Winnipeg in 1894. I have not seen a specimen since." (Hanham.)

Platynus clemens, Lec. Rare in Canadian collections. Originally described from Nova Scotia. St. John, N.B. (McIntosh.)

Platynus hardyi, Lec. This beetle has been taken on the sea shore in Nova Scotia in former years by Mr. Harrington; also, in numbers along the Nepigon River. (Fletcher.) Common, St. John, N.B., 1901. (McIntosh.)

Chlaenius purpuricollis, Rand. One specimen taken at Brandon, September 27, 1900. Another was taken on almost the same spot, April, 1897. (Hanham.)

Chlaenius interruptus, Horn. "In May, 1898 and 1899, this species was abundant along a short piece of railway line, two or three hundred yards, near Winnipeg." (Hanham.)

Tanyrhinus singularis, Mann. One flying October 24, 1898. Gabriola Island, B.C. (Taylor.) Massett, Q.C.I. (Keen.)

Adranes taylori, Wick. Two or three found in April and May in the nest of a yellow ant, Gabriola Island and Nanaimo. (Taylor.)

Mysia hornii, Cr. A few on currant bushes, Gabriola Island. (Taylor.)

Aphorista lata, Lec. Under bark of alder and hemlock, March to May, Nanaimo. (Taylor.)

Mycetina hornii, Cr. Nanaimo, May 22. One under bark of fallen fir, April 30. (Taylor.)

Perthalyca murrayi, Horn. Nanaimo, May 22. (Taylor.)

Derodontus trisignatus, Mann. In fungi, Wellington, B.C., November. (Taylor.)

Nosodendron californicum, Horn. About 20 in a crevice of bark of *Picea grandis*, May 13th, Wellington. (Taylor.)

Acmaodera pulchella, Hbst., and *A. culta*, Web. Specimens of these pretty little Buprestids were taken on the flowers of Butterfly Weed, *Asclepias tuberosa*, at Komoka, Ont., July 13. (Bethune.) Neither of these species had previously been recorded from Canada.

Chrysobothris pusilla, Lap. and Gory. Ottawa, rare. (Fletcher, Harrington.) St. John, N.B. (McIntosh.) One specimen in each case.

Endeodes collaris, Lec. A few specimens of this rare species were taken by Rev. G. W. Taylor at Victoria.

Listrus motschulskii, Lec. Common on blossoms of Amelanchier at the end of April, Wellington, (Taylor.)

Polycaon stoutii, Lec. One specimen in twig of apple tree, Nanaimo, (Taylor.)

Molorchus longicollis, Lec. One on crab blossom, Gabriola Island, May 25. (Taylor.)

Ulochetes leoninus, Lec. Two specimens on July 2 and 14, Nanaimo, and Gabriola Island. (Taylor.) Vernon, B.C. (Fletcher.)

Acanthocinus obliquus, Lec. Quite common on a fence near poplars, August and September, 1899; not seen since. (Taylor.)

Pachyta armata, Lec. Four specimens of this handsome beetle were taken flying round flowers, at an altitude of 7,000 feet, on Mount Che-am, B.C., August 15. (Fletcher.)

Anthophylax malachiticus, Hald. Six specimens flying low in a beech wood, Aylmer, Que., 1900, and eight specimens in the same place, June, 1901. (Fletcher.)

Anthophylax attenuatus, Hald. Three specimens, St. John, N.B., July. (McIntosh.) Ottawa, very rare; one specimen, June. (Young.) Another specimen was taken at Ottawa many years ago by Mr. Harrington.

Anthophylax mirificus, Bland. Both sexes. Vernon, B. C. (E. P. Venables.)

Leptura Matthewsii, Lee. Pine Creek near Calgary (Wolley-Dod). Vernon, B.C. (E. P. Venables.)

Priognathus monilicornis, Rand. A widely distributed but usually rare (Edemerid. One specimen under log, St. John. (McIntosh.) Several flying in May, Wellington, B.C. (Taylor.)

Rhinosismus pallipes, B. and L. One only, April, 24. (Taylor.)

Asclera nigra, Lec. Gabriola Island; four specimens. May 13-15. (Taylor.)

Orchestia ornata, Horn. One on apple blossoms, May 4; Gabriola Island. (Taylor.)

HYMENOPTERA.

Some good work has been done in this order during the season. The most active workers have been the following: Mr. W. H. Harrington, of Ottawa, who continuously adds to his own extensive collections and has also done good work in the way of identifying specimens and helping others. The writer gratefully acknowledges many favours in the determination of parasites bred from larvæ collected in the field and from scale insects. Mr. Chagnon, of Montreal, continues his studies of this order, and Rev. G. W. Taylor, of Wellington, Vancouver Island, has also added considerably to the knowledge of British Columbian Hymenoptera.

The attention of our own members may be profitably directed to the recent systematic work of Mr. W. H. Ashmead, of Washington, undoubtedly the highest authority on American forms. His monographic writings have added immensely to the knowledge of these insects, and his recent scheme of classification marks a great advance upon that of Cresson, published in 1887. It has been adopted by Howard in his admirable "Insect Book." Such portions of the

classification as have appeared must be carefully studied by all workers in this vast and difficult, but most interesting order. Ashmead divides the Hymenoptera into ten superfamilies, viz., *Apoidea*, *Sphecoidea*, *Vespoidea*, *Formicoidea*, *Proctotrypoidea*, *Cynipoidea*, *Chalcidoidea*, *Ichneumonidea*, *Siricoidea*, and *Tenthredinoidea*. These are subdivided into ninety-four families. The parts of the classification already published are the following:—(1) The Ichneumonidea, by the United States National Museum (Proc. XXIII., No. 1206), in which over eleven hundred genera are tabulated. (2) The Apoidea, in Trans. Am. Ent. Soc'y., 1899. (3) The Sphecoidea in the Canadian Entomologist for 1899 and (4) The Vespoidea (in part), in the same publication in 1900. The continuation of this most important and satisfactory work will be welcomed by all interested. It is much to be regretted that a larger number of our Canadian entomologists do not devote more attention to the Hymenoptera. Most attractive fields of study, with ample room for original observations, are offered in each superfamily, especially in connection with the social groups of bees, wasps, and ants, as well as in the great complex of parasitic species which play such an important role in the control of injurious insects in all orders. We trust that next year's record may be able to show that some useful work has been performed in this fertile field.

Among interesting captures mention may be made of the following:—

Bæus niger, Ashm. Reared at Ottawa from a batch of spider's eggs; 4 males and 20 females. (Harrington.)

Hecabalus lyeti, Cresson; and *Hecabalus utilis*, Cresson. Reared in large numbers at Ottawa from axe handles infested by the Powder-post Beetle (*Lyctus unipunctatus*). The parasites most abundant in June and October. (Fletcher.)

Abia kennicottii, Nort. One specimen at Trenton. (Evans.) This is by no means a common insect, although odd specimens are occasionally taken. The pretty white larvæ, spotted with yellow and black, may sometimes be found on Honeysuckle.

ENTOMOLOGICAL RECORD: ORTHOPTERA.

CONTRIBUTED BY MR. E. N. WALKER. (TORONTO.)

The marked progress that has been made in the study of North American Orthoptera during the past few years has shown no sign of abatement during the present year, although very little has been done to further our knowledge of the Canadian fauna, nor does the writer know of anyone in the country who is specially interested in this order. It is to be hoped that this state of affairs will soon pass away, since, owing to the tireless energies of Mr. Scudder, it is now a very simple matter to obtain the literature necessary to a student of the order. With Scudder's "Guide to the Classification of N. A. Orthoptera," the "Catalogue of N. A. Orthoptera," and the "Index to N. A. Orthoptera," the student should experience little difficulty in arranging his collection. The Index is by far the most important work on N. A. Orthoptera that has appeared during the present year, and too much can hardly be said in its praise. It is absolutely indispensable to the student, and contains remarkably few errors. One feature of this work, particularly, which is one of immense value, is the full list of localities given under each reference. By this means the student can learn accurately the distribution of any species.

Of other writings on Orthoptera published during the year, some of the more important are the revisions of several of the smaller genera by Scudder; a few papers by Morse, such as "New N. A. Orthoptera" (Can. Ent., XXXIII., 129); "The Xiphidiini of the Pacific Coast," (Can. Ent., XXXIII. 201); "Revision of the Orthopteran Genus Trimerotropis," by J. McNeill (published by U. S. Nat. Mus.), are important papers, in which 24 new species are described; and "Notes and remarks on Mexican Orthoptera, with descriptions of new species," and other papers, by J. A. G. Rehn. The "Insect Book," by Howard, must

not be omitted, as it will be of great benefit to the beginner, and the plates will serve to give a good idea of the general appearance of most of the genera he is likely to meet with.

In regard to Canadian Orthoptera, it may be mentioned that, since the last instalment of the writer's "Notes on some Ontario Acridiidae" was printed, he has added four more species to the number, and is now engaged in preparing a complete list of the Acridiidae of Ontario. These four species are the following :—

Tryxalis brevicornis, L. Pt. Pelee, Aug. 8, 1901.

Orphulella pelidna, Burm. Sarnia, Aug. 12 and 14, 1901.

Trimerotropis huroniana, n. sp. Southampton, Aug. 20, 21, 29, 1901.

Paroxyzia floridana, Thos. Arner, Aug. 9, 1901.

Nothing of any importance has been written on the other families of Orthoptera in Canada, but the writer has for some years been making a collection of the Ontario forms, and will soon have a preliminary list of the Locustidae ready for publication. Of the last-named family only eight species have been recorded from Ontario, and the lists from the other parts of Canada are no better. The writer, however, has taken twenty-two species in the province, seven of these having been taken for the first time this season. They are the following :—

Scudderia texensis, Pict.-Sauss. Pt. Pelee, Aug. 8 ; Arner, Aug. 9 ; Sarnia, Aug. 12, 14 ; Walpole Island, Aug. 13.

Conocephalus Nebrascensis, Bruner. Sarnia, Aug. 12.

Orchelimum nigripes, Scudd. Pt. Pelee, Aug. 7.

" *indianense*, Blatchl. Sarnia, Aug. 14 ; Arner, Aug. 8.

" *longipenne*, Scudd. Pt. Pelee, Aug. 8 ; Walpole Island, Aug. 13.

Xiphidium attenuatum, Scudd. Pt. Pelee, Aug. 8 ; Walpole Island, Aug. 13.

Atlanticus pachymerus, Scudd. Arner, Aug. 9.

Of the Gryllidae and Blattidae, the writer's collection contains a number of species as yet unrecorded from Canada. Of these, a few Gryllidae were taken this year for the first time, *Nemobius palustris*, Blatchl., from Sarnia, Southampton, Owen Sound (Aug.), and Lake Simcoe (Sept.) ; and *N. maculatus*, Blatchl. (Tobermory, Aug. 25), being noteworthy. The others have not yet been satisfactorily determined.

Collections of Orthoptera were made at the following localities during the past season :—

Toronto, Lake Simcoe, Leamington, Point Pelee, Arner, Chatham, Sarnia, Walpole Island, (St. Clair River) ; Goderich, Southampton, Tobermory, and other points in the Bruce peninsula and Owen Sound.

In addition to the above, collections of Orthoptera have been made at Aweme, Man., by Mr. Norman Criddle ; also in Central Manitoba and in the Okanagan and Nicola valleys, in British Columbia, by Dr. Fletcher.

A DAY AT THE MER BLEUE (EASTMAN'S SPRINGS, ONT.).

BY ARTHUR GIBSON, OTTAWA.

An excursion to the Mer Bleue at any time from April to November is always of keen interest to Ottawa entomologists. The nature of the locality, and the varied forms of life to be met with there, all tend to entice those who delight in observing and collecting specimens of natural history. The name Mer Bleue is applied to a vast peat bog, which at one point comes close to Eastman's Springs, Ont., and being in a comparatively undisturbed state, as far as the interference of man is concerned, naturally at once suggests itself as a favourite resort for naturalists. Local investigators have always considered this large swamp, and its immediate vicinity, a most lucrative point at which to collect. The members of the Ottawa Field Naturalists' Club have on several occasions journeyed in a body to Eastman's Springs to spend the day collecting, etc., and on all such excursions many interesting plants, insects, etc., have been found.

On the 30th May, 1901, Dr. Fletcher, Mr. W. E. Saunders, of London, Ont., Mr. C. H. Young, of Hurdman's Bridge, and the writer, spent a delightful and successful day at the Mer Bleue. After a 12 mile drive from Mr. Young's residence on the Rideau River, about 10 a.m. we reached the house of our good friend Mr. Manus, who on all such occasions receives us hospitably and kindly allows us to "put up" our horse, etc., for the day. Mr. Manus's house is close to the edge of the swamp, and on the above mentioned date, as soon as we had donned rubber boots, or an old pair of ordinary boots, and ladened ourselves with collecting apparatus, lunch, etc., we immediately headed for the bog. The morning was rather overcast and there was just enough wind to keep down the mosquitoes, which naturally swarm on the bog. This advantage, however, somewhat prevented other and more desirable insects from flying.

Close to the swamp *Pyrausta octomaculata*, with its quick, flighty movements, was readily noticeable and very abundant. After passing through a rather obstructive thick growth of alder, which fringes the margin of the sphagnum carpeted bog, and wading in water sometimes up to our knees for about ten minutes, we reached the swamp proper and at once began collecting. Just at the entrance is a small cleared space of quaking bog covered with cranberries, and with a bubbling gas spring in the middle. Here we stopped a few minutes to drink the water, and to light the bubbles of gas as they rose to the surface. The first specimen found was a nice fresh example of *Hemaris thysbe*, which had just emerged, the wings being still quite soft. *Thecla augustus*, which is always a frequenter of the Mer Bleue, was the first diurnal taken, but it was a little late for perfect specimens. We were hoping to find the larva of this species, but we were too late. This *Thecla* is fairly abundant every season in this locality, and as nothing is known of the earlier stages of this interesting species, we were anxious, if possible to learn something about it. Several females were followed and watched carefully to see if we could detect them in the act of laying eggs. Dr. Fletcher has reared the closely allied *T. irioides* from caterpillars found feeding on green apples in Vancouver Island, and was of the opinion that the food of the larvæ of *T. augustus* would prove to be the green berries of the Blueberry, or the capsules of some Ericaceous plant, of which there were many kinds growing in profusion on the bog. The females rested for tantalizingly long periods on flower clusters of *Kalmia glauca* and *Ledum latifolium*, both of which were in flower, as well as on the now flowerless bushes of *Cassandra calyculata* which occurred everywhere, but not a single egg could be found.

Over the whole of this immense swamp the aromatic white-flowered Labrador Tea (*Ledum latifolium*), the Leather Leaf (*Cassandra calyculata*), the Sheep-laurel (*Kalmia glauca*), and the delicate Andromeda (*Andromeda polifolia*) were in great profusion. Flying among these, as well as among other plants, were hundreds of specimens of the following geometers, usually to be found in swamps at this season: *Nemaria grataria*, *Fidonia truncataria*, *Eumaturga faxonia*,

Semiothisa granitata, and *Epirranthis obfirmataria*. It was a little late for these species, but nice examples of all were taken.

The most interesting discovery of the day occurred after we had been in the swamp for about an hour, when our attention was drawn to the destruction which had been wrought to the young tamarac and spruce trees (*Larix Americana* and *Picea nigra*). Many of these young trees, particularly towards the top, were denuded of their foliage. After a careful investigation of the branches and remaining leaves, without any insects being found, it occurred to us to examine the moss at the base of the trees. This was not in vain, for as soon as we began to remove the wet moss from the base of the trees, we discovered evidence of the presence of larvæ, by finding some frass, and upon further examination soon located the culprits. These caterpillars were from three to six inches below the surface of the wet moss, and of course were simply hiding during the day, until nightfall, when they would again ascend the trees and begin feeding. Later, however, Dr. Fletcher found a few specimens of the larvæ feeding on the foliage. The trees which were most attacked were small ones, from two to four feet high. About 25 specimens of the larvæ, in all, were collected, but unfortunately only those cared for by Mr. Young produced imagoes. The larvæ collected by Dr. Fletcher and the writer, although feeding well in confinement, and pupating in a healthy condition, failed to give the moths. Some of Mr. Young's specimens were forwarded by Dr. Fletcher to Prof. J. B. Smith, for identification, and the species proves to be a new one to science. In 1899 Mr. Young took one specimen of the moth at the Mer Bleue on the 30th August, and another specimen was taken by him in the same locality last year, early in September. Prof. Smith has named this species *Semiophora Youngii*, in honour of the discoverer. The caterpillar is from about an inch and a quarter to nearly an inch and a half in length, and, for a caterpillar, is a beautiful creature. A description will be given in the Annual Report of the Entomologist and Botanist, to the Dominion Experimental Farms for 1901. The moth is also a beautiful species, varying considerably both in colour and distinctness of markings; it expands about an inch and a quarter.

As the morning was dull and cloudy, I was in hopes that the sun would come out, at least for a while, during the afternoon, as I was anxious to see *Chionobas jutta* flying, the Mer Bleue being one of the few localities in Canada where this interesting butterfly has been found. My hopes were not disappointed, for soon afterwards the clouds broke and the warm sun appeared in all its glory. It had hardly done so when just ahead of me I noticed a large brown butterfly flying rather quickly. Of course, I immediately gave chase, and in about a minute had netted my first specimen of *Chionobas jutta*, which proved to be a perfect female. Several other specimens were afterwards caught in tolerably good condition. This butterfly, although not very difficult to catch, has the habit of resting on dead branches and trunks of trees, where it is protected considerably by the resemblance of the under side of the wings to the bark, and where it is very difficult to catch.

In the twenty-fifth Annual Report of the Society, Dr. Fletcher published an article on the Pitcher-plant Moth (*Exyra rolandiana*). As neither Mr. Young nor I had ever seen the larva of this pretty little moth, we were anxious to see it at work, and were much interested when Dr. Fletcher, who knew its habits, called us to examine some infested pitcher plants (*Sarracenia purpurea*). We had not looked very long before specimens of the caterpillar were found, their presence being easily detected, as stated in the above article, by the brown dead patch on the leaf, where the caterpillar had fed for a time the year before and which showed plainly on the outside, also by the mouth of the pitcher having been drawn together somewhat, and the remaining space closed up with a web of fine silk. The caterpillar is an attractive one, as the following description, taken from Dr. Fletcher's article, will show: "Length when extended, three quarters of an inch; spindle-shaped; distinctly segmented; general outline closely resembling the larva of *Xanthoptera semicrocea*, figured by Prof. Riley on page 208 of the Canadian Entomologist, Vol. VI, but lacking the fleshy processes of the abdominal segments; head

and first segments small ; segments 2-7 gradually enlarging to 3 mm., and then tapering to the posterior extremity ; each segment velvety claret colour, the velvety pile only in the central part of the segments ; the intra-segmental sutures smooth, pale, in some specimens almost white ; head white, marked symmetrically on each side with three black marks, the uppermost almost round, the middle one crescent-shaped, and the lowest above the ocelli, comma-shaped ; spiracles brown, ringed with black ; on each segment about six small black tubercles bearing slender tawny bristles ; thoracic feet and prolegs darkened externally." The pitcher plant is very abundant at the Mer Bleue, and we soon found a number of the larvæ. These were in different stages of development, from about three-eighths of an inch to full grown larvæ. One pupa was also found in one of the plants. The moth " is a small, thick-set insect, about three-eighths of an inch in length, of a dark, metallic, purplish hue, which on the forewings is relieved by a yellowish discal patch. The base of the wings is deep red. The dark colour on the wings of the female is much blacker than in the other sex. The hind wings in both sexes are black. When at rest, the wings are sloped like those of a *Plusia*."

Lithacodia bellicula, a pretty little noctuid, was fairly common, and some nice fresh specimens were secured. Two other interesting noctuids were captured, viz. that beautiful, and extremely difficult to catch, little species, *Anarta cordigera*, which had been taken here before, and which we were specially on the look-out for, and *Mamestra rugosa* ; one specimen of the former was collected by Mr. Young, and one of the latter by the writer, this being the first record of the occurrence of *M. rugosa* in the Ottawa district.

Argynnis tricoloris always an interesting butterfly is also a frequenter of the Mer Bleue, but on account of its rarity few specimens are found. We were in hopes of meeting with this insect, and, although we watched for it throughout the day, no specimen was captured. A few *Argynnis* were noticed flying, and specimens of *bellona* and *myrina* were caught. Whether any of those observed were *tricoloris*, we could, of course, not be sure. The species flies about a fortnight later, Dr. Fletcher having taken specimens at the Mer Bleue on the 11th June one year and on the 16th June another year.

Doubtless, if the weather had been more favourable, other interesting lepidopterous insects would have been observed. Specimens of coleoptera, hymenoptera and diptera were collected and some rather rare species secured. These insects would, of course, have been more plentiful, had the day been brighter.

While Dr. Fletcher, Mr. Young and the writer were occupied the greater part of the day in hunting for insects, or in collecting plants, Mr. Saunders who is an ardent ornithologist, armed with his field glass, was busily engaged the whole time "looking up" birds and studying their ways. Some nice nests, with eggs, of the Palm Warbler, the Nashville Warbler, the Swamp Sparrow, and the White-throated Sparrow, were secured, and many useful notes were made upon the habits of the birds mentioned.

We reluctantly turned our steps homewards as evening came on, well loaded down with specimens of plants and insects, and with some clutches of rare eggs, determined if possible to return again next year, a little earlier in the season, so as to tackle the problem of the food plant of *Thecla augustus*, and later to learn something of the life-history of *Chrysophanus epixanthe*, which swarms on the Mer Bleue about the 1st July.

COMMERCIAL ENTOMOLOGY, OR INSECTS AND INSECT-PRODUCTS MET
WITH IN COMMERCE.

BY CHARLES STEVENSON, MONTREAL.

Everyone is familiar with the valuable place that the silkworm holds in commerce. But it would surprise many persons if told how many of those creatures familiarly known as "bugs" command a price in the market, and very incredulous some would be, if informed that the only too common "bed-bug," *Acanthia lectularia*, Linn., or "B-flat," as it was called by a musical wag, is used as a drug. A certain school of practitioners prescribe this pest in the form of a tincture, as well as another "bug-bear" of the cleanly housewife—the cockroach, the species *Periplaneta Americana*, Linn., being specified for the purpose. Not long ago, *Periplaneta orientalis*, Linn., the "oriental roach" or "black beetle," a native of Asia, which is now found in most parts of the civilized world, was recommended for the same use as the "blister beetle" or "Spanish fly," *Cantharis vesicatoria*, Linn., which is an official drug in both the allopathic and homœopathic pharmacopœias. The Spanish blister beetle is indigenous to southern and central Europe, living on the ash, lilac and elder trees. It is of a brassy green colour, and is collected in Spain, Italy, Hungary and Southern Russia, but that which comes from the latter country is most esteemed and is larger and of a copper colour. Several American species are found to possess efficient vesicating properties; among them may be mentioned the "potato-fly," *Epicauta vittata*, Fab., which has the thorax black and the wing cases with yellow stripes; *E. cinerea*, Fab., a black species, *E. marginata*, Oliv., another black species, with ash-colored margins on the elytra; *E. atrata*, Fab., uniformly black, and smaller than those previously mentioned. There is a species very abundant in Kansas and Colorado, *C. Nuttali*, Say, which closely resembles the true Spanish blister-beetle, and has also attracted attention in pharmaceutical commerce.

Two vesicating insects, *Mylabris cichorii*, Fab., and *M. phalerata*, Pallas, indigenous to East and South Asia, and also to some districts of Africa, are now imported as "Chinese blistering flies, and are found to be quite as efficient as the official insect. *Lytta gigas*, Fab., of the East Indies, is also sometimes met with in commerce.

The "oil-beetle," *Meloe majalis*, is prescribed in homœopathy as a tincture, to make which the living insect is drowned in alcohol.

If allopathic medicine were to give way to the doctrine of "*similia similibus curantur*," farmers might be able to form a "combine" for the supply of the "Colorado potato-beetle," *Doryphora decemlineata*, Say, that insect being the base of a certain tincture, made by taking the living insects, one part, crushing them, adding five parts of alcohol, macerating for eight days in a dark, cool place, shaking twice a day, and then pouring off the liquid, straining and filtering. In the same way medicines are made of several spiders, and a trituration is prepared of the freshly-spun webs of the genus *Aranea*.

Although entomologists have often raised spiders for purposes of scientific observation and investigation, spider-raising as a money-making industry is somewhat novel. One has only to go four miles from Philadelphia on the Lancaster pike, to the farm of Pierre Grantaire, and see what can be found nowhere else in the United States, and abroad, only in a little French village in the department of the Loire. Pierre Grantaire furnishes spiders at so much per hundred for distribution in the wine vaults of merchants and the *nouveaux riches*.

In some forms of practice several "live" insects that possess poisons are used in making tinctures; they are irritated or aggravated so as to make them "throw off" by shaking or stirring them up in a jar or bottle. One of these creatures that is "first made mad" before the introduction to alcohol is the "hornet" *Vespa crabro*, Linn.; another is the well-known "honey bee," *Apis mellifica*, Linn. Besides the tincture of the whole insect, the pharmacist prescribes

the virus, to be obtained in the following way: "Draw out the sting, together with the poison bag, from a bee freshly killed. Take hold of the bag, insert the point of the sting into a small glass tube and squeeze the poison into it, or take a small bee with a pair of pincers and allow it to seize a small lump of sugar, which will absorb the poison." This hymenopterous fly is an important factor of the produce market, being the manufacturer of a wax much used for many purposes, and that sweet article of household use, as also in dispensing drugs—honey.

Other victims of the pharmacist are the bright-red minute *Acarus Trombidium mauseæ domestica*, which the pharmacopœia states is "found under the wings of the common fly in Philadelphia." The aphid or plant louse of *Chenopodium glaucum*, and the red ant, *Formica rufa*, Linn. Nor does the gardener's friend, the "Lady-bird beetle," escape, for the "live insects" are "pounded to pulp" and triturated with sugar of milk.

It is recorded that the Greek barber surgeons of Asia Minor valued ants for holding together the edges of a cut. They held a large *Camponotus* in a forceps and when it opened its mandible, wide, it was permitted to seize the edges of the cut, which were held together for the purposes its head being cut off as soon as a firm grip was made. A similar practice was observed in Brazil several years ago by M. Morqueys of Rouen, and is cited by Sir John Lubbock but is not mentioned by either Bates or Wallace.

The bushmen of the South African district Kalahai set a high value on the leaf-beetle *Diamphidia*, as they use its juice and its larva for poisoning their arrow-heads.

For the Arts and Technical Sciences, there are several insects that are of great value. We have to thank a small Mexican scale-insect *Coccus cacti*, Linn. for the brilliant colour called cochineal which has superseded even the splendid and regal "Tyrian purple" of ancient days. It is used in the manufacture of dyes, paints and in pharmacy and also for coloring confectionery. It is of no value in medicine although it has been used as an "anodyne, tonic, astringent." Another important hemipterous insect is the West Indian *Coccus lacca*, Kerr. the female of which punctures the young branches of several tropical trees, thereby producing a resinous product called lac, stick-lac, or shellac, used in the manufacture of varnishes, sealing-wax and a dye called Lac-lake. Indian cochineal is prepared from stick-lac and imported from India for coloring woollen and silk-goods. Its colour is similar to, but less brilliant than cochineal. *Coccus ilicis*, Fab. supplied the famous dye KOKKOS of the Greeks, Coccus of the Romans, Kermes of the Arabs, Cocchi of the Italians and Al-kermes of the Persians. Though a larger species than *C. cacti* its colour is inferior and less in quantity. Chinese-wax is the produce of a similar insect *Ericerus pela*.

In Syria a peculiar secretion called Manna is produced by the punctures of the female *Coccus manniparus*, Fab. on the young shoots of the *Tamarix mannifera*, Ehrenberg. It is a kind of reddish syrup containing glucose, dextrin, and cane-sugar, and is eaten by the Arabs and the monks of Mount Sinai like honey with their bread. There is another product which goes by the same name in the drug trade, but it is not the same, it consists principally of a sugar called mannite. There are several other saccharine products of insects which have been classed with Manna, but they are not entirely soluble in water. The term manna is more interesting historically than the article now known by that name. It was originally applied to the food so miraculously supplied to the Israelites during their wanderings in the wilderness. What that substance was we do not know. The natives around Mount Sinai believe that the substance collected by them is what the children of Israel fed on.

That rapacious insect, the migratory locust (*Edipoda migratoria*, Linn. is valued as an article of food in Arabia and Egypt. They appear in the markets preserved in brine or sun-dried and are even exported as an article of commerce. Some authorities claim that it is the insect which St. Matthew (III. 4) refers to when he says "John's meat was locusts and wild honey" and in Leviticus (XI. 22) we find that locusts constituted a common food among the Jews.

In Tokio, Japan, twelve varieties of katy-dids or bell-insects, are sold, nine of which are bred in captivity. The purchasers keep them in cages for the sake of their musical sounds, as we do song birds.

The essential constituents of ordinary writing ink are galls mixed with iron sulphate and gum. These galls are produced by a small hymenopterous insect *Cynips galle-tinctorie*, Oliver, on the *Quercus infectoria*, Oliver, of the Levant. That instrument said to be mightier than the sword is dependent on a very small creature for its power. There are many other galls but they are not much in demand.

It is well known that what is perhaps the richest and most elegant apparel which adorns the human race is the product of a caterpillar,—the silk-worm,—*Bombyx mori*, Linn. Much attention has been given of late to other silk producing larvæ, many of whose products are being found of service, especially :—*Philosamia cynthia*, Drury, the Ailanthus moth. *Antheraea mylitta*, Drury, the Tussah moth. *A. yamamai*, Guer. of Japan and several similar moths.

During recent years the exporting and importing of insects by Economic Entomologists has been resorted to, for the purpose of preying on other insects that may be destroying food-plants.

In closing this short review of the role of insects in the commercial world, attention might be called to the fact, that there are many persons who make more than a livelihood by collecting and selling Entomological specimens to collectors and curiosity hunters, the experiences and anecdotes of whom are often very entertaining.

THE FOOD OF THE GRASS SNAKE.

BY J. B. WILLIAMS, F.Z.S., TORONTO.

There was an article in the Annual Report for 1896 on Insectivorous Mammals,* and the relationship which they sustain, on account of their food habits, to Economic Entomology.

I find that the food habits of one of our Reptiles,—the little Grass Snake (*Liopeltis vernalis*, —are of considerable economic interest.

I have often tried to keep these snakes alive, but never, until recently, have been able to find any food that they appeared to relish ; but while looking under a plank one summer for earthworms and slugs with which to feed some Dekay's Brown Snakes that were in the same glass case with the green ones, I found several of the Noctuid caterpillars that go by the name of "cutworms," and put them in the reptile case with the earth-worms. They had not been in for a minute before the Grass Snakes seized and eagerly devoured them, though they had rejected all other food that had been previously put into the cage. They continued to take them readily until the supply of "cutworms" was exhausted, and then, as I could find nothing else that they would eat, I let them go.

People generally try to kill grass snakes if they find them about their lawns, but it is evident that they should be protected and their enemies killed. No bird could have reached these caterpillars in the position where I found them under the plank, but it was just the kind of place into which a snake could creep and obtain its food. They probably eat other smooth caterpillars, and where numerous would be a check on the dreaded "army worm," for from the eager way they devoured the cutworms, Noctuid larvæ evidently constitute one of their favorite foods.

The Grass Snake is a beautiful little creature and perfectly harmless. Its food habits show that it is very beneficial, and it should be protected in every way and not destroyed or wantonly put to death.

THE NORTH-WEST (CANADA) ENTOMOLOGICAL SOCIETY.

ANNUAL MEETING.

The third annual meeting of the North-West (Canada) Entomological Society was held at Lacombe, Alberta, on November 9th, 1901. The chair was taken by the Vice-President, the Rev. M. White. Many letters were received in support of the meeting, among them being a letter from Dr. James Fletcher, Dominion Entomologist, of kindly advice to the young people of the newly-formed Lacombe Field Club, and a letter from Mr. C. W. Peterson, Deputy-Commissioner of Agriculture, N.W.T. Mr. Peterson expressed particular satisfaction at the number of agricultural societies throughout the North-West Territories which had decided to encourage the Entomological Society by affiliating with it. This, he said, is a step in the right direction, and that if agricultural societies would more generally support such institutions they would more nearly fulfil the objects contemplated in the law under which they were organized. An earlier letter from Mr. Peterson was also read advocating the enlistment of the sympathy of the school teachers and trustees throughout the Territories in support of the movement.

Among those present at the meeting were two of the teachers of the Lacombe school and a number of the pupils of the school.

The Chairman, after some opening remarks, called upon the President, Percy B. Gregson, for his address, which we give as follows :

. PRESIDENT'S ADDRESS.

“Ladies and Gentlemen,—We have now completed the third year of our existence as a society, and it has become the custom to review the progress we have made during the preceding year, and to consider what good we have done. By thus taking stock, as it were, of our conduct, we gain some light on the course we should pursue in the forthcoming year. In this vast new country a society of any sort to become popular has to enlist the sympathy and interest of the settler, and to do that it must show that its labors are identical with the farmer's welfare. When this is clearly understood the Society becomes a popular institution ; and this is one of the reasons why we have annual meetings. The chief work of the Society is to study and encourage throughout the land an interest in insects and plants and their habits, and a knowledge of the remedies used against such as are injurious. The time has passed when such a study was looked upon as an evidence of lunacy, and I believe we shall see, within the next few years, the introduction into every school in the country of a system of nature study. The young people must be encouraged to take an active interest in the subject. The study of insects is emphatically one which develops the powers of observation.

Some idea of the practical value of this subject to the farmer may be formed from the fact that the damage done by insects last year to the farming and gardening industries in North America amounted to many millions of dollars, and a glance presently at the list of injurious insects for 1901 will show that the Territories are sharers in this great loss. Farmers as a rule are wide-awake enough to anything which threatens their pocket, though it is strange how indifferent many of them seem when their crops are threatened by insects or weeds. They will allow, for instance, the wholesale destruction of turnips and cabbages by insects, when a few cents worth of hellebore and kaintit, or Paris Green would have saved much of the crop. And farmers are just as culpable in the matter of weeds.

The question therefore arises,—“How does the Society propose to assist the Farmer?” and in answering this let us first see what we have already done.

In the Society there are two branches of study,—Entomology and Botany. Under Entomology is included insects (noxious, beneficial, harmless, etc.,) and under Botany is included the study of their food, and the study of weeds and other wild plants. Firstly, then, addresses

on insects or weeds have been given whenever requested at Farmers' meetings. About seven of these, besides some written addresses, have been given during the year at different places.

Secondly, the Society has distributed to every affiliated agricultural society (except to those but recently affiliated) a collection of ripe weed seeds, in little labelled bottles, of nearly every species of noxious weed within the Territories. This will enable any farmer, by applying to the Secretary of his Agricultural Society, to see what sort of weeds he has in his seed grain.

Thirdly, the Dominion Entomologist, Dr. Fletcher, has offered two prizes (standard works on Entomology) to the young folk of Lacombe district for (1) the largest collection of insects and (2) the best collection of noxious and beneficial insects, and the Society has supplemented these prizes by a cash prize of a dollar for the best collection of wild plants (including noxious weeds). There have been several young competitors. Prize No. 1 was won by Master Benj. H. Howell of Lacombe; prize No. 2 by Master D. E. Tipping of Waghorn, and that for wild plants and weeds, by Miss Lucy McL. Howell of Lacombe (all members of the Lacombe Field Club).

Fourthly, a Field Club has been formed of some of the young folk of Lacombe under the Society's auspices, and by the example these young people set, many of the prejudices against insects will, it is hoped, be dispelled. For instance, with what horror the dragon fly is often regarded. We hear them called "Devil's darning needles," and that they will sew up little boys' eyes and ears; and we hear of caterpillars and beetles that they will bite us; and many other similar prejudices exist. These prejudices really are harmful, because they lead our young folk into error, and on account of these prejudices many insects are cruelly destroyed which should be preserved, and on account, too, of them our young folk conceive a distaste for studying their habits.

Fifthly, the Society has distributed to non-subscribers some hundreds of copies of those two excellent agricultural papers, *The Nor-west Farmer* and *The Farmers' Advocate*. These papers, or one of them, should be taken by every farmer in the country. In addition to this, the Secretary of the Society has written (as replies) many scores of letters of advice on special noxious insects to farmers individually, with the remedies.

Within the last year several agricultural societies have affiliated with, *i. e.*, have become supporting and subscribing members of the Entomological Society. The names of these affiliated Societies are the Westaskiwin, Lacombe, Red Deer, Innisfail, Olds, Calgary (Inter-Western Pacific), Regina, Moosejaw and Central Saskatchewan. These in return for their financial support and influence have the right to claim addresses from the Entomological Society at their Institute, or other meetings. The funds of the Society (\$1 membership or affiliation) are supplemented by an annual grant from the Territorial government, and are devoted solely to extending the Society's work. This, then, is some outline of what the Society has already done.

Let us now turn to the next part of our programme:—"How shall we proceed in the future?" I think that the course I have just outlined should be further pursued. Every feature of it, and particularly that of encouraging the younger people, can I believe be extended with benefit to the country. Written or verbal addresses will be given willingly, whenever desired by affiliated agricultural societies. Further prizes will be offered for competition, and these competitions will next year be thrown open to the young folk throughout the Territories.

With regard to the schools, I may say that the teachers (3) in the Lacombe School are actively interested in the work of the Society, and the trustees of that school give every encouragement, and we hope to extend this interest to teachers in certain other schools next year;

and personally I should like every one (teachers and their pupils, farmers and their young folk are especially welcome) to come at any time to my residence, and inspect, under my supervision, the collections of the Society. There, besides many beautiful insects, they will see represented very many of the noxious and beneficial insects from all parts of the States and Canada, and learn the remedies.

More agricultural societies will also be invited next year to support the Entomological Society. This, as Mr. Peterson observes in his letter, is also a step in the right direction, and in accord with the spirit of the law under which the agricultural societies are formed, and with the sentiment of the Department. The distribution of collections of weed seeds will be extended, and a collection of named pressed noxious weeds themselves will gradually be prepared for each affiliated agricultural society. I am endeavoring to form collections of named noxious and beneficial insects for distribution in the same way. I want every insect—no matter how many—sent to me for that purpose every year. The Society will provide the cases and pay all necessary postages. It would be my wish to start a museum of weeds and insects in every school and agricultural society in the Territories if they would only show an active interest in the matter. I have prepared the first of such collections of weeds; this, if the Lacombe Agricultural Society will accept it, will go there and be kept near the collection of seeds, for public reference. A case of insects will also shortly be ready for it, and it will not be my fault if there is not also next year the founding of similar collections at the Lacombe school. Turning our attention now to the insects of 1901, I wish first to thank Mr. T. N. Willings, the Territorial Weed Inspector, and the many other gentlemen who have sent me very valuable accounts of insects noticed by them.

NOTICEABLE INSECTS OF 1901 IN ALBERTA.

Undoubtedly the most conspicuous feature of the year throughout the whole of Central and Northern Alberta from Olds to Edmonton, and east into parts of Saskatchewan, has been the myriads of dragon flies. In the early part of the year we were threatened with an unusual plague of mosquitoes. The flooded sloughs teemed with their larvæ, but very soon after the appearance of the perfect mosquito the dragon flies came on the scene, and during July and August immense numbers filled the country, and in many parts they literally exterminated the mosquito on the wing. Nothing but good has ever been recorded of the dragon fly,—(Fig. 57) in fact their mouths are not adapted for eating vegetation, and their larvæ and pupæ live wholly in water, and in both stages are active, their food being larvæ of mosquitos and other soft-bodied aquatic insects

Of a different nature, another remarkable occurrence of the season throughout the entire

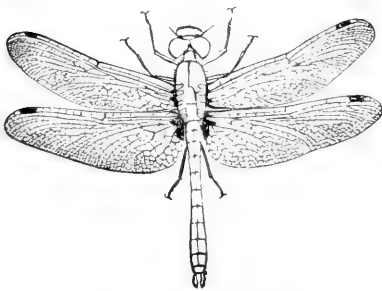


FIG 57.—A Dragon-fly.

North-West from far south of Calgary, and reported by Mr. T. N. Willing, Mr. F. H. Wolley-Dod, Mr. Clare, of Edmonton, and residents in Prince Albert, Grenfell, Beulah (Man.), and elsewhere, has been the very large numbers of caterpillars of the Painted Lady butterfly (*Pryameis cardui*). The favorite food of these caterpillars is Thistle (including—let us be thankful—the Canadian Thistle), Blue Bur and Pasture Sage. Mr. A. J. Dennis, of Beulah, says that, during four consecutive days in the first week of May, there was a continuous flight of these butterflies in a southeasterly direction, with wind blowing from the south.

Warbles this spring were decidedly more abundant than last year. The deaths of a good many cattle in the early part of the year were, I believe, accelerated, if not directly caused by this pest. On one carcass I counted 175 distinct warbles.

The Horse bot-fly has also been very troublesome.—(Fig. 58.) I might suggest here a simple remedy for this, which was published some time ago by the United States Department of Agriculture, and appeared in one of our agricultural papers. Bruise some Tansy and make an infusion of the juice,—in other words, tansy-tea. Give the horse some of this tea in the morning, and a dose of salts in the evening, and it is said a complete cure will be effected. The process seems like this,—the tea operating to kill the bots clinging to the membrane of the horse's stomach, and the salts expelling the dead bots.



Fig. 58.—Horse Bot-fly. Female.

The Diamond-back moth (*Plutella cruciferarum*) has been again very abundant in all parts of the Territories, seriously damaging many turnip and cabbage crops. The field of riddled and bleached plants was a common spectacle. From the presence last year of parasites in considerable numbers, there were hopes that this pest would not be troublesome this year, but every turnip and cabbage field neglected becomes a simple breeding ground for this insect.

Some cabbage crops about 12 miles east of Lacombe also suffered from the Red turnip-beetle (*Entomoscelis adonidis*). Its appearance is also reported from a few widely separated points in the Territories, but in certain places where it was abundant last year it seems temporarily, at least, to have disappeared.

The Colorado potato-beetle (*Doryphora decemlineata*) is gaining headway. They are reported from Calgary, MacLeod, Pincher Creek, Walsh, Moosejaw and other points. The winters are not fatal to this pest, which passes that season composedly in the pupa state.

Another pest of the potato field more troublesome this year than usual is a wireworm,—chiefly (so far as I have observed) the larva of a "Daddy Long-legs" or Crane fly (*Tipula*). It was a common thing (on taking an average sample) to find 15 per cent. of the potatoes affected by this grub. Reports of its prevalence come from all parts of the Territories.

Damage by root maggots of various kinds has also been conspicuous this year. It is reported from many points, and more particularly from Edmonton and St. Louis (Sask.). Cauli-flowers, cabbages and turnips were all about equally the sufferers. Mr. Willing reports the larvæ of a "Cabbage" butterfly (*Pieris protodice*) as having been rather abundant in gardens around Regina, and here and there the little active flea-beetle (*Haltica striolata*) has been destructive to young turnips.

Of foliage trees, Mr. Willing mentions Tent-caterpillars of both species (*Clisiocampa Americana* and *C. disstria*) as having been abundant in Assiniboia, and, for the first time recorded, considerable numbers of the latter species appeared in the Red Deer and Lacombe districts (on aspen poplar). I found a large percentage of these were parasitised by Tachina flies, and I hardly think trouble will be given by this pest for awhile. Aspen poplar also suffered in early spring throughout the entire North-West from the Pallid aspen beetle (*Gonioctena pallida*); and the disagreeable larvæ of the Striped Cottonwood beetle (*Lina scripta*), the pest of osier growers, again attacked willows on river banks, and in Regina box elders suffered from the Box-Elder bug.

Of fruit trees, the black currant in gardens around Regina is reported to have suffered from the "Currant worm."

Cutworms, which must not be confounded with wireworms, from which they are in every way distinct, have not this year given so much trouble. The heavy rains were unfavorable for their development as a pest.

With regard to grain, there have been several complaints of injury to oats when in first blade, the blade wilting away and dying. In two cases which I went to see, the damage was the work of a wireworm of the same genus (*Tipula*) as that affecting potatoes, though a different

species. Mr. Willing mentions some talk by farmers of wheat being slightly damaged by an insect, but a report of a more serious nature comes from St. Louis (Sask.), where rye suffered from a stem-midge maggot, which fed within the stem about 1 to 2 feet above ground, and deadened the straw before the heads filled. Several farms, it was stated, bore evidence of the presence of this pest in the rye fields, the heads and straw turning white and dead six weeks before harvest.

A few more words and I will close the list. I made some mention last year of the liability of the arrival of new pests, to which we, in a new country, were always subject. It would seem there are this year two absolutely fresh pests to be reported, both of them beetles. One (*Trirhabda attenuata*) I have found in considerable numbers on raspberry canes (eating the canes bare of leaves), and the other (*Dichelonycha testacea*) on French beans and other garden stuff.

With regard to remedies, as I have taken up so much space already, I will, if the papers will lend me a column, publish in detail, before the winter closes, those which are recommended for each pest.

After the close of the discussion consequent on the address Mr. Howson P. Foulger, of Urquhart, near Lacombe, and Dr. A. E. Jamieson, of Lacombe, were elected members of the Society, and the officers of the Society for 1902 were elected. The officers for 1901 were re-elected, with the exception of Mr. W. Wenman (one of the Council), who has left the country, Mr. Foulger accepting office in his place.

Miss Lucy McL. Howell was then called up and received her prize from the chairman, and the books for prizes Nos. 1 and 2 (Dr. Fletcher's) were selected.

Acknowledgments of several gifts of insects to the Society's collections were then recorded, and the Report of the Council and the Auditor's Report read and the interesting proceedings terminated.

REPORT OF THE COUNCIL.

On behalf of the Council of the North-West (Canada) Entomological Society the President begs respectfully to submit the following report:--

There has been a somewhat drastic remodelling of the Members' Roll. For some two years the Roll has been encumbered with the names of gentlemen who, in the inception of the Society, became admitted as members, but who notwithstanding their membership have done nothing to help it forward. In our articles of constitution there is a clause providing for the automatic removal of such apathetic gentlemen from the Roll in the event of no interest in the Society being evinced by them for a period of eighteen months from enrolment. They cease to be members. These gentlemen occasion needless expense to the Society, and the result of the operation of the above mentioned provision has been that thirty names have been expunged from the Roll. The members helping the Society by cash or kind number thirty-seven. Space will not allow publication of their names, but the President, as the person perhaps most deeply interested in the success of the Society, takes this opportunity to thank each of them, as it were, in person. It would be invidious to single out any individual, as necessarily some have more facilities than others; but all, as the President gratefully believes, support the Society from the purest and most disinterested motives. An institution of this kind is not a commercial concern paying dividends, though as an element of civilization such an institution does, it is conceived, benefit the community as a whole. This, however, the President can safely say, that had it not been for the guidance of his steps by Dr. James Fletcher, Dr. L. O. Howard, Mr. C. W. Peterson, Prof. C. C. James, Mr. H. H. Lyman, and the Rev. Dr. Bethune, and encouragement of other gentlemen, his pathway would have been strewn with boulders.

Additional substantial gifts of Lepidoptera by Messrs. N. B. Sanson, E. F. Heath, and William Wenman, and of Coleoptera by the Rev. Dr. Bethune and Messrs. A. W. Hanham and

Alex. Kwiat (and among the Coleoptera being a series of Parnidae from Mr. W. D. Richardson), and most generous exchanges by Dr. Strecker, Messrs. W. N. Tallant, Frederick Knab, the Hon. P. C. Truman, and other gentlemen, and a gift by Dr. Fletcher of a series of mosquitoes, have materially augmented the Society's Collections. These gifts are extremely acceptable.

The interest of farmers in the objects of the Society is steadily increasing,—this is evidenced by the affiliation during the past year of additional agricultural societies with our own.

Dr. James Fletcher in the early summer generously offered two prizes for competition by the young folk of Lacombe for the best general collection of insects, and the best of noxious and beneficial insects, the Society adding a third prize for pressed wild plants (including weeds). The Lacombe Field Club furnished the prize winners among several competitors. Rains during the summer interfered somewhat with regular outings of the Club.

PERCY B. GREGSON, President.

November 7th, 1901.

AUDITOR'S REPORT.

Receipts and expenditure of the North-West (Canada) Entomological Society for 1901 :—

RECEIPTS.		EXPENDITURE.	
	\$ c.		\$ c.
Members' fees	25 00	Meetings (farmers, etc.)	14 85
Territorial Government Grant	25 00	Printing account	3 00
Deficit (met by President)	10 00	Subscriptions to agricultural, etc., papers..	8 50
		Stationery	8 00
		Cork, pins, etc.	5 40
		Apparatus	5 00
		Expense account (postages, freights, etc.) .	10 25
		Sundries (including prize, and distribution of agricultural journals)	5 00
	<u>\$60 00</u>		<u>\$60 00</u>

I have examined the books and vouchers of the Treasurer of the North-West (Canada) Entomological Society, and find them correct, and the above is a true statement of its receipts and expenditure for 1901.

(Signed) J. L. TIPPING,
Auditor.

November 8th, 1901.

OBITUARY.

MISS ELEANOR A. ORMEROD, LL.D.

The Science of Entomology in its practical application to agriculture has suffered a great loss through the death of Miss Ormerod, which took place at her residence, Torrington House, St. Albans, England, on Friday, July 19th, 1901. Economic entomologists, not only in England but throughout the world, have been moved with profound regret that a career so remarkable and so useful should have been brought to a close, but one could hardly hope that the aged lady would long be able to sustain the burden of increasing infirmities and the trials of a painful and protracted illness.

Miss Ormerod was born at Sedbury Park, Gloucestershire, on May 11th, 1828, and had thus entered upon her 74th year. She was the youngest of a family of ten, consisting of seven sons and three daughters, of whom she was the last survivor. Her father, Mr. George Ormerod, LL.D., F.R.S., F.S.A., etc., was a distinguished literary man and the author of a notable "History of Cheshire;" her mother was a daughter of Dr. John Latham, F.R.S., at one time President of the Royal College of Physicians. On both sides, therefore, she inherited literary

and scientific tastes, and at an early age displayed a love for natural history and out-door pursuits.

One of Miss Ormerod's earliest recollections (as related by Dr. Fream in the "Journal of the Royal Agricultural Society") was being placed in a chair to watch some large water-grubs in a glass, when, to her amazement, one of the creatures which had been injured was devoured by its companions. This youthful observation inspired her with a taste for natural history investigations, and with them she combined a deep interest in botany, horticulture and agricultural chemistry; she also applied herself to the study of Latin, German, French, Italian, Spanish, and other languages. While devoted from her earliest years to objects of out-door life, she was constantly confined to the house by repeated illnesses, but this enforced seclusion only served to render her a more minute, painstaking and exhaustive observer. As her father became advanced in years, it devolved upon her to take a large share in the management of his estates, which included a home farm, and in this way, no doubt, she was led to give the practical turn to her entomological investigations which caused them to be of so much public value afterwards. She also when quite young took an interest, that she continued to maintain throughout her life, in meteorological observations, and in course of time published "The Cobham Journals" of meteorological and phenological records made by Miss Molesworth at Cobham in Surrey. She was the first lady to be admitted as a Fellow of the Royal Meteorological Society, as she was also the first lady to receive (in 1900) the honorary degree of Doctor of Laws at the University of Edinburgh. On the latter occasion Sir Ludovic Grant, the secretary to the Senatus, in presenting Miss Ormerod to the Vice-Chancellor, spoke as follows:—

"Our roll of honorary graduates in law contains the names of many illustrious men, but you will search in vain for the name of a woman. To-day, however, a new roll is to be opened—a roll of illustrious women, and it is matter for congratulation that this roll should begin with a name so honored as that of Miss Ormerod. The pre-eminent position which Miss Ormerod holds in the world of science is the reward of patient study and unwearying observation. Her investigations have been chiefly directed towards the discovery of methods for the prevention of the ravages of those insects which are injurious to orchard, field, and forest. Her labours have been crowned with such success that she is entitled to be hailed as the protectress of agriculture and the fruits of the earth—a beneficent Demeter of the Nineteenth Century. It would take long to enumerate her contributions to entomological and phenological literature, but I may select for mention the valuable series of reports, extending over twenty years, the preparation of which involves correspondence with all parts of the world. Remarkable, too, is the list of the honors which she has received. She was the first lady to be admitted a Fellow of the Royal Meteorological Society, and she has been awarded the silver medal of the Société Nationale d'Acclimatation of France. To these distinctions the University of Edinburgh, sensible of her conspicuous services, and not unmindful of her generous benefactions, now adds its Doctorate in Laws."

A beautiful collection of injurious insects, and an accompanying series of diagrams, the work of Miss Georgiana Ormerod (her elder sister), now the property of the university and in the custody of the Industrial Museum, Edinburgh, were the much appreciated gift of Miss Eleanor Ormerod. An excellent oil painting of herself, also the gift of the generous donor, has been hung in the university court-room, where it occupies a suitable position in the inner circle of those whom the university has delighted to honour.

At Sedbury, where she continued to live until the death of her father in 1873, the farmers and farm labourers keenly appreciated the value of Miss Ormerod's studies when they understood what good results might follow from them, and they not only gave her the benefit of their own observations in the field, but rendered willing aid in tracing noxious insects and collecting examples of the mischief they were doing. By 1868 her attainments in the science of economic Entomology were so well recognized that she was invited to contribute to a collection then begun by the Royal Horticultural Society and the Science and Art Department of South Kensington,

to illustrate insects useful or prejudicial to agriculture. She had previously invented a process of her own for the execution of plaster models, colored by her own hand, of rare garden plants and hot house flowers, and also a method of making electrotypes casts of leaves and reptiles, which were remarkably beautiful and artistic. For ten years she was a constant contributor to these collections not only of insects, but also of interesting specimens of grain, roots, timber, etc., exhibiting the nature of the injury done. As an acknowledgement of the value of the assistance she thus afforded, the Royal Horticultural Society presented her with its "Silver Floral Medal."

In 1872 she contributed to the International Polytechnic Exhibition at Moscow a collection of models of insect injuries to plants and electrotypes representing British Natural History. On this occasion also her work was so highly appreciated that she was presented by the University of Moscow with its Silver Medal, its great Silver Medal, and also its Gold Medal of Honour. At a later date she was awarded the Silver Medal of the Société Nationale d'Acclimation of France in recognition of her services in economic entomology.

In 1877 Miss Ormerod, then in her forty-ninth year, began, with the assistance of her sister, Georgiana, her especial work which caused her to become known throughout the world as the foremost authority in England on practical entomology. She then undertook the preparation of an annual "Report of observations of Injurious Insects and Common Farm Pests" and continued for twenty-four years to issue a volume at her own expense. When she commenced her arduous labours in this connection, very little was known by farmers and gardeners, and not much more by entomologists in Great Britain, of the habits and life histories of insects injurious to farm, garden and orchard crops and to live stock, or of the best means of destroying them or preventing their ravages. What Miss Ormerod did was to collect the observations of a large number of persons in the British Isles, made under her instructions for the most part, to obtain details of any experiments carried out for the destruction of insect pests or the prevention of their attacks, to correspond with workers in other parts of the world who were engaged in similar investigations, to systematise, arrange and publish the information thus obtained, with the addition of her own knowledge and observations of the subject. She also undertook to identify for enquirers any specimens of insects found preying upon their crops and to give prompt advice as to the most likely remedies to adopt. Her correspondence after a few years became immense and the work arduous in the extreme; but she was a woman of boundless energy, full of inspiring enthusiasm, whom nothing could daunt and who shrank from no difficulties or trouble. Her sister Georgiana, her constant companion during these years till her death in 1896, possessed a large measure of artistic talent and was invaluable through her ability in drawing illustrations of insects and their works. She published some years ago a large series of excellent coloured diagrams of injurious insects, which the writer, as well as others, has found most useful for the illustration of lectures on subjects of this kind. Her loss was an irreparable one to her lifelong companion and co-worker.

Something of the nature of Miss Ormerod's work, how she appreciated her correspondents, and the modest estimate at which she appraised her own great services to her country, are well stated in her simple and natural way in the preface to her last, the twenty-fourth, Annual Report. When she began the great work of her life in 1877, to quote her own words, "Comparatively little was known of the habits and means of prevention of insects seriously injurious to our crops, and of this little a very small amount was accessible for public service, and I undertook the series of Reports in the hope (so far as in my power lay) of doing something to meet both these difficulties." How fully her hope was realized is shewn by her further statement, "Now the necessities of the case have been gradually changing. Year after year information has been sent, gradually completing most of the histories of most of our worst insect pests, and now additional information is rarely on points of great agricultural importance." In other words she has succeeded, by dint of long continued and hard work, in making fully-known the life histories of all the most serious pests in the British Isles, and in prescribing the best avail-

able methods of dealing with them. No such work can ever be finished or ever be perfect, but Miss Ormerod has done the task of a pioneer; she has cleared away the obstructions of ignorance and has laid solidly and well the foundations of a knowledge that requires now only to be kept up and added to as time goes on and changes naturally occur. A further quotation reveals the nature of her work and her recognition of the services of others:

"But the work was hard; for many years for about five or six months all the time I could give to the subject was devoted to arranging the contributions of the season for the annual report of the year, with additions of the best information I could procure from other sources (in every case, whether of contributors or otherwise, fully acknowledged). . . . I claim no credit to myself in the work; but those who will look over the names of the contributors given with their information will see how deeply indebted I am to them, and to other good friends, who have placed their experience and great knowledge at the public service. To them, and to all who have assisted me, and to some who have allowed what began as agricultural communication to ripen into valuable friendship, I offer my grateful thanks and my deep appreciation of their goodness, and I trust they will believe that if, as I well know, much of my work has not been as well done as it would have been in better qualified hands, at least I have earnestly tried to do my very best."

Miss Ormerod's investigations were not confined to insects affecting vegetation and farm products, but included those attacking live stock also. One of her most useful works was her campaign against the Ox Warble-fly, which she conducted with her accustomed energy and enthusiasm until the great suffering to animals, the heavy losses to their owners and the serious damage to hides which it caused became known far and wide. As a result of her work cattle-owners in all parts of the world now know the best course to pursue to rid their cattle of the maggots of the insect, or better still, to prevent the insertion of the eggs that produce them. Corresponding enemies of the horse, the deer and the sheep were also investigated by her, and the results published in the annual reports.

In addition to the four and twenty volumes of Reports, Miss Ormerod published a number of other works on Entomological subjects; among these may be mentioned the "Manual of Injurious Insects," 1881; "Guide to Methods of Insect Life," 1884; "Injurious Insects of South Africa," 1889; "A Text-book of Agricultural Entomology"; "Observations on Warble Fly"; "A Hand-book of Insects injurious to Orchard and Bush Fruits"; and a number of pamphlets on such subjects as the Hessian Fly, the use of Paris Green, the Turnip Fly, Root attacks on Turnips and Cabbage, etc.

Besides the distinctions already referred to Miss Ormerod was an honorary or corresponding member of a large number of Scientific Societies in Europe, America, Australia and South Africa, Fellow of the Entomological Societies of London and Stockholm, Honorary Entomologist to the Royal Agricultural Society and subsequently Examiner in Agricultural Entomology in the University of Edinburgh. For many years past she was an honorary member of, and took much interest in, our Entomological Society of Ontario.

Miss Ormerod was indeed one of the most remarkable women of the latter half of the nineteenth century, and did more than anyone else in the British Isles to further the interests of farmers, fruit-growers, and gardeners by making known to them practicable methods for controlling and subduing their multiform insect pests. Her labours were unwearied and unselfish; she received no remuneration for her services, but cheerfully expended her own means in carrying out her investigations and publishing their results. In private life she was kindly and hospitable; with an old-fashioned courtesy, and the manners and ideas of by-gone days, she and her sister possessed a charm all their own, and the writer recalls with pleasant memories his visit to their home at Isleworth. By whom in England her work can be continued we do not know; it is not likely that anyone can follow in the unique path laid out by Miss Ormerod. We may therefore, cherish the hope that the Government of the day will hold out a helping hand and,

establish an Entomological Bureau for the lasting benefit of the great agricultural interests of the country.

C. J. S. B.

OTTO LUGGER.

The ranks of American economic entomologists have suffered a serious loss through the death of Otto Lugger, State Entomologist of Minnesota. He died on the 21st of May, 1901, from pneumonia, after a very short illness, in the 57th year of his age. From Dr. L. O. Howard's obituary notice in *Science* the following particulars have been gathered. Mr. Lugger was born at Hagen, Westphalia, his father being a professor of chemistry in a Prussian university. In 1865 he came with his parents to the United States, and obtained a position in the Engineer Corps of the Army; he was engaged for two years in a survey of the Great Lakes. He had always been interested in entomology, and collected specimens during his engineering work. Becoming acquainted with Dr. C. V. Riley at Chicago, he went with him to St. Louis as assistant on his appointment to be State Entomologist of Missouri in 1868. For eight years he continued to be Dr. Riley's "quiet, unassuming, self-sacrificing and devoted helper." At the end of this period he married and removed to Baltimore, where he became the Curator of the Maryland Academy of Science and naturalist of the city parks. Ten years later, in 1885, he was appointed assistant in the Division of Entomology of the U. S. Department of Agriculture and remained in Washington for three years; he then became Entomologist to the State Agricultural Experimental Station of Minnesota and continued to hold this position till his death a few months ago.

"His first entomological experience in the State of Minnesota was one of great interest and importance, and his vigorous and intelligent action in the face of a great emergency fixed his standing as a most useful officer firmly in the minds of the Minnesota farmers. An enormous swarm of the Rocky Mountain locust, or western migratory grasshopper, had settled down in Ottertail County. By Lugger's advice and energetic field work, backed as he was by a public spirited and intelligent Governor (Hon. W. R. Merriam, now director of the U. S. Census), who personally guaranteed the funds necessary for the campaign, the hordes of destructive insects were annihilated and great damage was averted."

From that time on, for nearly 13 years, he continued his active work, issued frequent publications, and gained the profound respect of his constituents and of the scientific men of the country. His more important works were a series of profusely illustrated papers on the different orders of insects found in the State; the parts he was enabled to publish were on the Parasites of Man and Domestic Animals, the Orthoptera, Lepidoptera, Coleoptera, and Hemiptera of Minnesota. At the time of his death he was preparing the parts on Diptera and Neuroptera, which, it is hoped, may have been left sufficiently advanced for publication. The series, if he had lived to complete it, would have formed an admirable manual of Entomology for the Western States, and of use to naturalists everywhere; they were written in a clear and interesting manner, and prepared with great care and accuracy. He was also a good botanist, and published several useful papers on plant diseases.

In 1899 Mr. Lugger, accompanied Dr. Fletcher in an investigation of the areas in southern Manitoba which were infested by the Rocky Mountain Locust during the preceding year, and aided him in the discovery of eggs and freshly emerged young locusts near Deloraine. He also joined with Dr. Fletcher in addressing a number of meetings of farmers in different parts of the province.

He is described by Dr. Howard as "a man of admirable qualities; his wide information, his agreeable personality, and his keen sense of humour, made him a most delightful companion. Many of his stories and humorous sayings are current among entomologists all over the United States, and his loss will be felt for many years to come."

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Hodge & Bunnell

ENTOMOLOGICAL SOCIETY
-98-634

THIRTY-THIRD ANNUAL REPORT

OF THE

ENTOMOLOGICAL SOCIETY

OF

ONTARIO

1902.

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.)

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO.



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PRINTED BY L. K. CAMERON.

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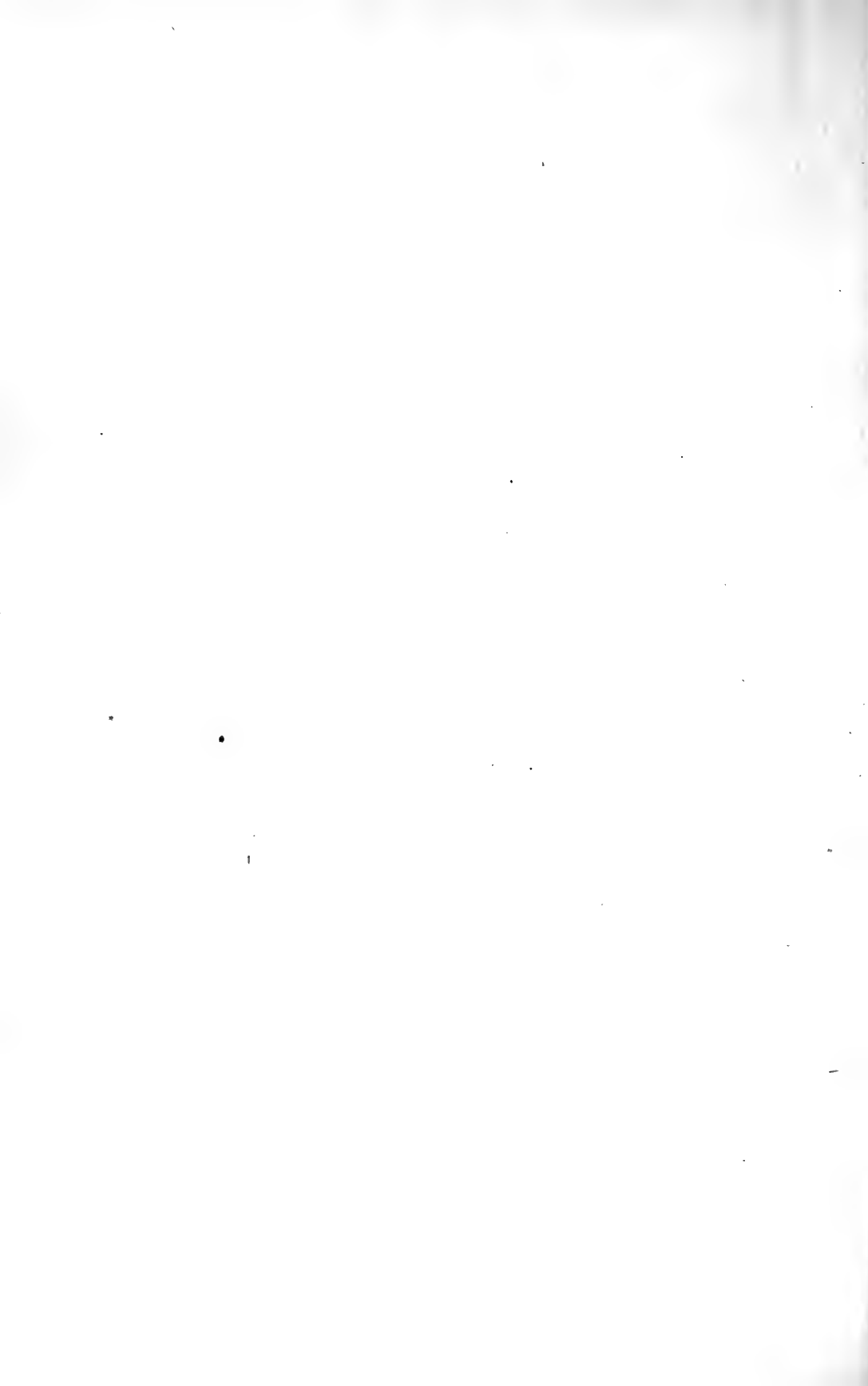
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1903.



WARWICK BRO'S & RUTTER, PRINTERS,
TORONTO.

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WILLIAM E. SAUNDERS,
Secretary of the Entomological Society of Ontario from 1887.





JOHN B. REED

An original member of the National Society of the Sons of the American Revolution



THIRTY-THIRD ANNUAL REPORT
OF THE
ENTOMOLOGICAL SOCIETY OF ONTARIO
1902.

To the Honorable John Dryden, Minister of Agriculture :

SIR,—I have the honor to present herewith the Thirty-Third Annual Report of the Entomological Society of Ontario.

The Thirty-Ninth Annual Meeting was held in London, on Wednesday and Thursday, October 29th and 30th, 1902. A full account of the proceedings, with the papers read and reports submitted, is given in the following pages. An interesting and important feature of the meeting was a conference on the Pea-Weevil, its injuries to the crop in Ontario and the best means of reducing its ravages.

The *Canadian Entomologist*, the monthly organ of the society, has been regularly issued during the past year, and has now completed its thirty-fourth volume. It continues to maintain its reputation as a scientific magazine of high character.

I have the honor to be, Sir,

Your obedient Servant,

CHARLES J. S. BETHUNE,

LONDON, ONTARIO.

Editor..

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THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

ANNUAL MEETING.

The thirty-ninth annual meeting of the Entomological Society of Ontario was held in London on Wednesday and Thursday, the 29th and 30th, of October, 1902. The chair was taken by the Rev. Dr. Fyles, of South Quebec, President. Among the members present were Mr. Henry H. Lyman, Montreal; Dr. James Fletcher and Mr. Arthur Gibson, Central Experimental Farm, Ottawa; Mr. Charles H. Young, Hurdman's Bridge, Ont.; Mr. John D. Evans, Trenton; Mr. George E. Fisher, Inspector of Scale Insects, Freeman; Prof. W. Lochhead, Ontario Agricultural College, Guelph; Rev. Dr. Bethune, Dr. Woolverton, Dr. Stevenson, Messrs. J. A. Balkwill, J. H. Bowman, E. A. Browne, J. Dearness, C. J. Fox, C. W. Horton, John Law, J. Alston Moffat, W. E. Saunders, Walter Smith, and other residents of London. The Society was also favoured with the presence of Prof. C. C. James, Deputy Minister of Agriculture for Ontario; Mr. W. L. Smith of the *Toronto Weekly Sun*; Messrs. Thompson and Black of the *Farmers' Advocate*; Mr. Pearce, and other visitors.

Letters expressing regret at their inability to attend were received from Mr. W. Hague Harrington, Ottawa and Mr. E. M. Walker, Director, Toronto; also from Prof. F. M. Webster, Urbana, Illinois.

During the morning of Wednesday, Oct. 29th, a meeting of the Council was held for the transaction of the business of the Society and the preparation of their annual report. It was decided to hold the next annual meeting of the Society in Ottawa in September, 1903. Sheet Cork and Entomological pins were ordered to be sold to members at cost and to others at twenty per cent. advance on cost, and arrangements were made for obtaining a supply of black enamelled steel pins. A resolution was adopted permitting the Ornithological Section to alter its name to "The McIlwraith Ornithological Club (Ornithological Section of the Entomological Society of Ontario)."

In the afternoon the Society met at 2.30 o'clock, the President, Rev. Dr. Fyles, in the chair, and proceeded to discuss the prevalence of the Pea Weevil in Ontario and the best means of controlling its ravages.

THE PEA WEEVIL CONFERENCE.

At the request of the President, Dr. Fletcher, of Ottawa, introduced the subject of the Pea Weevil. The following is a condensed summary of his remarks:

Dr. FLETCHER: Mr. President and Gentlemen. Everyone must have noticed for many years the great reduction which has been gradually taking place in the area of land devoted to the cultivation of Peas. This I find has been almost entirely due to the fact that farmers find that pea growing is not a remunerative occupation, owing to the diminution both in output and the value of the grain due to the attacks of the Pea Weevil. In my own Reports, which reach a considerable number of farmers in the Dominion, I have constantly drawn attention to this injury and the simple means of controlling the insect which causes it, but the loss at the present time is so serious and the pea crop is one of such enormous importance that I feel something more definite than has been done in the past should be done to bring this subject prominently before the country, so as if possible to stir up the pea-growers and seed-dealers throughout the Dominion and in the adjacent United States where peas are grown to join in one great, universal, and co-operative effort. The pea crop is of special value to farmers be-

cause nothing quite takes the place of peas as feed for pigs. This has a direct bearing, not only upon the pork and bacon trade of the country both for home use and export, but also upon the closely associated industry of dairying. Moreover, it seems to me that the problem now before the country is an exceptionally simple one, and Prof. Lochhead and I have been considering what can be done to change the existing state of affairs. Naturally, in such an important matter we have the keenest sympathy of both the Honourable Sydney Fisher and the Honourable John Dryden, who are most anxious to find out what can be done to protect this important crop. It is for this reason that the Council of the Entomological Society of Ontario have thought it wise to arrange for to-day's conference, so that some steps may be at once taken to arouse interest and also that more energetic measures may be adopted than have been in the past.

The greatest enemy of the pea crop is the Pea Weevil, *Bruchus pisorum*, (Fig. 1), more generally known in trade as the Pea Bug. This insect has been established in Canada as a pest of the pea for a great many years but during the last ten years it has become such a serious

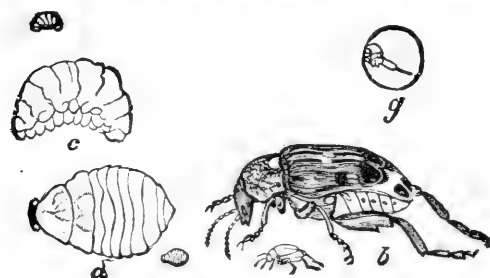


Fig. 1.—The Pea Weevil.

enemy that in many of our Ontario districts where peas could be grown some years ago of the very highest quality—of such a high quality indeed that Canadian peas were considered the best that could be produced in all the markets of the world,—farmers have now given up the cultivation of peas altogether, and in many other districts they are now talking of doing the same. Personally, I do not believe that it is necessary to give

up the cultivation of peas nor that it would be a wise thing to do so. The crop as I have stated above is one of exceptional value, and I cannot see how this step would be of very much benefit in controlling the insect. It has been suggested—and I may mention that this seems to be the favourite remedy proposed by most people who have written to me,—to stop growing peas for one or two years, and to pass some law by which everyone is prevented from sowing. I do not believe that, if any such legislation were passed, it could possibly be enforced; for, to be effective, the cultivation of peas would have to be stopped absolutely in every pea field and private garden, both in Canada and the United States. I am quite certain that many would not regard this law and would insist on growing a few green peas for table use, and although every wise gardener who knows how to make the best use of his ground pulls up his vines as soon as his crop of green peas is picked and uses his land for something else, the people who would sow peas in opposition to the law, belong to the class of gardeners who leave their pea vines standing in the garden all through the summer, and upon these a sufficient number of small pods containing weevils would be left to ripen, to destroy the effects of the whole experiment. Many people would openly defy this law and claim that it was absurd, nor would this be much to be wondered at when we see how little informed most of the dealers and pea growers are with regard to the Pea Weevil and the extremely simple means by which this pest can be reduced. Although it is true that many of the large seed merchants have fumigating houses for the treatment of infested peas, many of them, I know as an actual fact, do not use them regularly and one of our large Canadian seed houses even wrote to me that as long as everybody was not forced to fumigate their peas they did not intend to do so, that it was an extra expense and caused trouble with the insurance companies. I believe that instead of legislation the proper course to adopt at the present time, is to provide accurate information with regard to the life history of the insect, the best remedies and the best way to apply them; then, to distribute this so freely all over the country that everyone interested may at any rate be

reminded at the proper time what steps should be taken, and, not only this, but every other citizen of Canada, whether he knows that he is interested or not, should be made to wonder what all the agitation was about.

If all seed merchants would, for their own sakes, give the recognized remedy of fumigating peas with bisulphide of carbon a trial, and sell no peas for seed which they were not certain had been fumigated, and if all growers of peas would refuse and send back to their seed merchants every sample of peas containing living weevils, I feel sure that evident results would be seen in a single year. The problem is extremely simple, but it requires perfect co-operation. There are, of course, difficulties to be met, but I cannot yet find any of these which cannot be overcome. The amount at stake every year which runs into millions of dollars at any rate, makes it worth while for every member of this Society and for everyone connected officially with any agricultural institution, to make a great effort. The state of public opinion at the present moment seems to point out that this is an opportune time to make this effort. In many districts farmers have already practically given up growing peas. There are also indications that, owing probably to the damp cool season of 1902, a larger proportion than usual of the Weevils are passing this winter inside the seed peas and, consequently, could be easily destroyed by fumigating. The magnitude of the loss is now generally recognized, and farmers throughout the country are in a state of nervous anxiety and ready to listen to and act upon any suggestions which commend themselves to their common sense.

The life-history of the Pea Weevil is briefly as follows: The eggs are laid on the young forming pods by the beetles which have wintered over either in the seed peas or about buildings. As soon as the eggs hatch, the grubs eat their way through the forming pod and attack the pea which is nearest to them. They penetrate this, and soon by the increase in the size of the pea every trace of the hole is obliterated. The grub remains inside the pea until full grown, changing to a pupa in July and attaining the fully developed condition of a beetle before the middle of August. According to the season, a larger or smaller number of the beetles leave the peas in the autumn and pass the winter under heaps of rubbish, or secreted about buildings. I think the normal way for this insect to pass the winter is inside the seed peas. The important points to remember in this discussion and which induced me to say that the problem before us is a simple one, are the following: The Pea Weevil is not a native insect, and therefore has not an extensive range of food plants, in which it could live outside the cultivated pea. That plant, which is an exotic, is the only known food plant of the Pea Weevil and occurs nowhere in this country wild or even in a spontaneous manner. All plants which spring up in the field from accidentally dropped seeds are destroyed by our winters, therefore every seed sown for a crop of peas has at some time been in the hands of the grower or seed merchant, where it could have been treated by the well known remedy of fumigating with bisulphide of carbon, which for this insect is a perfectly practical remedy, and by a practical remedy I mean a remedy which is effectual, is simple so that it can be applied without any danger of error, and is cheap enough to make its application a paying operation. It is claimed by some that the chief difficulty in the way of trusting to fumigation as a main remedy for controlling the Pea Weevil is that a sufficient number of peas are shelled out in the field at harvest time to leave insects enough to emerge and infest the following crop, even if all the seeds were treated. To obviate this difficulty, I have recommended a plan which some have adopted to reap their crop as early as possible, as much on the green side as can be done with safety. It is a well known fact that seeds of all kinds reaped on the green side rather than when they are over-ripe, have a higher germinating power. It is certain that they would shell out in the field less, and, if such seed were fumigated at once, the weevils would be destroyed inside them before they had made a very serious diminution in the bulk of the seed. If there should be difficulties in the way of farmers themselves treating their seed at once, which however they are quite easily able to do,

they should without delay sell to the grain buyers, who knowing the advantage of fumigating early would soon make arrangements, even if they had not these already, to treat the seed so as to get the best sample possible. With regard to those peas which shell out in the field, I cannot see any very great difficulty with these. It is the common practice in the pea growing districts for farmers to turn in hogs after the crop is harvested. These pick up every seed cleanly, and with the assistance of poultry I imagine that few infested peas would be left on the field to carry over the infestation. If thought preferable, these peas could be turned down below the point where the weevils would be able to reach the surface after emerging, by ploughing down the land deeply either in autumn, and of course preferably then, or in spring.

I have here some samples of peas which have been treated at various dates from the end of July until the middle of September. These have been kindly supplied by Mr. W. P. Niles, of Wellington, Ont., a well known seed merchant who deals largely in peas. By examining those fumigated on the 31st July, it is evident that the weevil is at that time very small and that the proportion of the pea which has been destroyed, is much smaller than it is when the peas have been treated only one week later, the grub being at that time not even half grown and only a small amount of the seed being destroyed. From that date on the destruction to the seed is rapid and by the middle of the month of August most of the peas contain full grown larvæ or pupæ. I have here samples of peas grown this year and treated on the 28th August, which contain the fully developed beetles, and it is probable that by the middle of the month in an ordinary year perfect beetles may be found. My recommendation therefore is that farmers should reap early, thresh at once, treat their seed, or sell to others who will, before the middle of August, and never sow a single seed which has not first been fumigated. Talk the matter up whenever an opportunity arises and guard against pooh-poohing the whole matter and saying: "Oh we know all about the Pea Weevil, that's the same as the Pea Bug;" we have always had that, and thereby arguing by inference that they always will have it.

Now I don't believe that there is any necessity for such a valuable Canadian crop as peas, either to be given up or to be infested by the Pea Weevil. I find from the August 1902 Ontario Crop Bulletin that the acreage this year under peas has been reduced from the area sown last year by 70,000 acres, and the yield by 1,274,000 bushels. This is undoubtedly a very serious loss, because certain districts of Ontario are particularly well suited for the production of this cereal. There is evidence to show that many of these districts specially suited to the cultivation of the pea crop, and where peas of the highest quality used to be grown, cannot now produce paying crops of peas owing to the depredations of the Pea Weevil. There are, however, many districts, as for instance the upper Ottawa country and other northern districts, where paying crops of peas are being or could be grown, and the passing of legislation forbidding the cultivation of peas over the whole province would therefore be a hardship. There is another point which may be referred to. It is frequently claimed by dealers that peas which have been injured by the pea weevil are just as good for seed as perfect seeds. This is manifestly nonsense, but, to be in a position to prove this, I have in several seasons experimented by sowing infested seed and taking careful notes on how many plants grew and what was the vigour of these plants. During the past season I planted several rows of early peas which had been bored by Pea Weevils. The average number of these seeds which grew and produced seed bearing plants was 7. and of these some were weakly. This is rather a lower average than has been obtained in previous years, but it was what the season of 1902 showed. It has been found by many experiments made by botanists at Washington and at Agricultural Colleges that large seeds of plants, as a rule, produce more vigorous plants than small seeds. Much more would this be the case where nature had laid up in a seed a certain amount of food to feed the embryo plantlet in that seed, and subsequently a large proportion even to one-fourth of its bulk was accidentally taken.

away, as in the case of peas injured by the weevil. In the many cases where the germ is destroyed by the weevil, of course no growth takes place at all.

This question of controlling the Pea Weevil in Canada is one which concerns everybody. It is not with the large seed merchants and big houses with which most danger lies but with the individual farmer and private individual who grow a few seed peas for their own use and do nothing to destroy the weevils in them before sowing. As I have stated, there are easy remedies which are available for all, such as holding over the seed till the second year, or treating it with coal oil, using one gallon to 20 bushels; but the best remedy consists in fumigating with bisulphide of carbon, and a farmer who has only five bushels of seed can fumigate this at the expense of a few cents by putting the five bushels in an ordinary coal oil barrel and then placing (either in an open dish on the top or by pouring the liquid straight upon the seed) one ounce of bisulphide for every hundred pounds of seed. A bushel of peas weighs about 60 lbs, therefore the five bushels would require three ounces. The barrel must be closed up tightly and left in an open shed away from other buildings for 48 hours. The bisulphide is a liquid with a very objectionable odour which vaporizes quickly at the ordinary temperature of the atmosphere. The vapour is heavy and quickly runs down through the peas, and, as it is exceedingly deadly to all forms of animal life, every insect in the peas will be killed. The unpleasant odour of the chemical is very soon dissipated when the peas are exposed to the air, and the value of this treatment is that not only are the infesting insects destroyed with certainty but this without injury to the seeds either as to their wholesomeness for food or as to their germinating quality for seed. If it is thought that there is any danger in using such an inflammable material as bisulphide of carbon or there is any hesitancy, as is sometimes the case in using a remedy with which farmers are not familiar, there is always at any rate available the old and well tried remedy of holding over the seed for two years, by bagging the peas immediately after threshing. If this is done with early harvested and threshed peas, not a single weevil can escape, for it has been proved that these cannot eat their way out from a bag of cotton, or even of paper, and all weevils which issue in the bags must die. A very rare instance is on record of a weevil living over in the seed until the second year, but this is such a rare exception that it need not be considered and does not amount to a proportion of one in many hundreds of millions; indeed is so rare that I do not know of a single instance where it has been authoritatively confirmed.

One of the largest seedsmen in Canada tells me that he has to send to Germany to get his peas grown. And we have competition to-day in the London market. Indian peas shipped from Calcutta are being sold at a few cents cheaper than we can get them to the London market, and they are as good as our best peas; therefore, our trade is in danger, and it is important that we should wake up at once and save this crop, which I believe can be saved if we will only go about it in the proper way.

Every letter I have received and every seedsman I have consulted, have agreed that public attention should be drawn to this matter. I have correspondents in all parts of the country, and all say it is a most important matter and requires immediate attention. There is no Society that can draw attention to it better than the Entomological Society. The seedsmen I have consulted, are of the opinion that, if the suggestions given above were adopted, a large reduction could be made in a very short time in the increase of this insect.

The acreage of peas is now reduced very low. It will not be increased very much next year, so that we have an opportunity to start now to draw public attention to this matter. Professor Lochhead and I have been corresponding about the subject for a year, and there is no doubt about it that the Federal and Provincial Governments will do all they can to draw public attention to the matter and to help in every possible way to get rid of this pest.

The Grass Pea, which has been suggested as a substitute for the field pea, has not proved as great a success as was hoped. It is not a pea, though it is considered a pea for many purposes,

but it belongs to the Genus *Lathyrus*. The pea is a *Pisum*. *Lathyrus* is another plant altogether, and that is the reason probably why the Grass Pea is free from the attacks of the Pea Weevil. It is a very late maturing pea, and I am sorry to say that those who planted it this year, owing to the late season, were disappointed in its growth, because it is a plant which comes from India; for that reason this damp moist season did not mature it, and it was not a paying crop. Vines which bore ripe peas in September, had as much of the vine covered with green leaves and flowers, as there was with the ripe peas. In the St. Catharines and Niagara Districts it has been grown to some extent. Most of the seedsmen are not in favor of the Grass Pea. I would not say, "Do not grow it," because, where the Pea Weevil prevents the growth of the proper peas, the Grass Pea forms a substitute which is comparatively valuable. There are difficulties in harvesting it, and the seeds are thought to be very hard, therefore, some farmers do not like it, but that can be overcome by crushing them with machinery.

I shall not take any more time now, but I shall be very much obliged if any one else would give us their ideas, either on what I have said or upon matters which I have left unmentioned. I have letters here from some of the leading seedsmen in Canada, saying they would have liked to be at this meeting, if they could have made arrangements. I am pleased that Professor James is here with us, and that Mr. Smith is here from Toronto, for the *Weekly Sun*, and Mr. Black from the *Farmers' Advocate*.

Prof. LOCHHEAD: Mr. President. The Pea Weevil is one of the greatest enemies of the farmer of Ontario to day. Before coming here I secured from Professor James the difference in the amount of seed grown in the year 1891 and 1902. The crop in Ontario in 1891 was eighteen and one half million bushels; in 1902 eleven and one half million bushels. That shows a decrease of seven million bushels in ten years; that itself is sufficient to direct serious attention to the subject.

Dr. FLETCHER: What is the average value of a bushel of peas, Mr. Pearce?

Mr. PEARCE: It is now about 60c. for field peas.

Dr. FLETCHER: I average it from 70c. to \$1.00 taking the common peas and the high class.

Mr. PEARCE: That would be about right for the high class.

Dr. FLETCHER: It is a loss, at any rate, of between \$5,000,000 and \$7,000,000.

Prof. LOCHHEAD: The pest is known in the northern counties and all along the shore of Lake Ontario. This summer I visited North Grey, and I found that the farmers in that district were seriously disturbed over an enemy that was new to them—so new that they did not know what it was. This was the Pea Weevil. I was travelling through the County on Farmers' Institute work and I gave two lectures a day on the Pea Weevil. This summer I had the pleasure of going up through Manitoulin Island and as far as St. Joseph's Island; no Pea Weevil exists there, and we saw beautiful crops. I have no doubt that Manitoulin Island is well adapted for pea growing, and I told the people up there that they had a great opportunity of making their island as famous for seed peas as the Jersey people had made theirs for Jersey cattle. If they would keep the Pea Weevil out, they might make it a reserve for growing pea seed. On St. Joseph's Island I found a good illustration of the fact that the Pea Weevil does not exist there. I spent one morning going through pea fields. One farmer told me he had imported some seeds and when they came the bag was literally alive with the Pea Weevil; however, he sowed the peas but took the precaution to sow about five times the normal amount per acre, and he had a good field of peas, I could not find a single weevil in the whole morning's examination of the growing crop. It showed conclusively that this year, at any rate, the pea weevil does not thrive in St. Joseph's Island.

With regard to the point which Dr. Fletcher emphasized very strongly, that the pea weevil does not reach its full size when the pea is harvested. I was unable to make an exam-

ination to any great extent, but I asked several farmers who were interested in the Pea Weevil to make an examination. Probably some of you know Mr. Lick of Oshawa, an up-to-date farmer. I asked him what in his opinion was the best time to treat peas and he said that in order to answer this question it is necessary to ascertain at what stage the crop was harvested ; he found that not more than one-half the damage was done until after the crop was harvested, and in many cases not more than a third of the damage was done before the pea reached maturity ; this was true of both the early and late varieties. He found a large percentage of the early crop was "buggy," and these were his conclusions : "Don't sow 'buggy' peas without treating the weevil. Harvest the crops as soon as ripe and thresh at once ; for seed peas fumigate at once ; if for feed, grind the peas up and so kill the weevil."

With regard to the number of weevils that germinate, Dr. Fletcher has given you his results, and you will also find them in his Reports. Mr. Zavitz, of the Ontario Agricultural College, also made experiments some years ago, and found in the case of the large variety of pea such as the Marrowfat, that three-fifths of the peas that had been entered by the weevil did not germinate. In the case of the small variety of peas such as the Golden Vine, he found only 13 per cent germinated.

I do not see any other way of treating the Pea Weevil except the method Dr. Fletcher has described ; I should like, however, to suggest another way by which we may reach the people. There is nothing like an object lesson. While we may do our best through the agricultural papers and reports of all kinds experience has shown that a great many people will not act ; they simply say they will not be bothered, and will grow enough peas for themselves, and not care whether they sell any or not. These are the kind of people we want to influence, as well as the larger growers. We do not know just exactly how far the Pea Weevil will fly ; I do not think they will fly much farther than from one farm to another. Mr. Pearce tells me that down in Elgin, in two sections that were separated by a woods, the Pea Weevils were in one section for many years but did not appear in the other section until they got in through the sowing of weevily seed ; I am of the opinion that the chief way in which the insect is disseminated is by sowing weevily peas. I would suggest that help be obtained from the Government for a series of experiments. First secure a good man to act as foreman or manager of the whole experiment and let him appoint a corps of assistants. These men he could train himself, and they should be able to fumigate properly, and then I should choose a section of country of two or three townships, and have these sections scattered in different parts of the Province so as to form as many object lessons as possible, a concession or two concessions might be allotted to each man. Every farmer should be interested in the matter and got to provide a pen, or coal-oil barrel, or box, in which to fumigate, the government might provide the material. I would have these men go systematically down the concession at harvest time and see that the peas are threshed immediately, and then fumigate them for the farmers. It might probably be necessary to fumigate twice. The men would not need to stay very long in one place. If the farmer had already prepared the pens, he could fumigate in an hour, and then go on to the next farm, and return and ventilate them after forty-eight hours. I think one man could in that way arrange for the fumigation of three or four concessions, and a couple of men could do a township.

A great many people do not believe in the entire efficiency of this remedy, and if we can get to their farms, and kill all the weevils, we shall soon convince them of its efficiency. This is a simple suggestion and I should like the members to discuss the matter.

Mr. FISHER : We live in Burlington and we formerly grew peas but of late years we have abandoned them altogether. I have always held that the appearance and the disappearance of the Pea Weevil coincided with the change of temperature. If we had a very low temperature during the winter the Pea Weevils were destroyed.

Dr. FLETCHER : What is your idea about the Grass Pea taking the place of the peas ?

Mr. FISHER : We grow the Grass Pea somewhat extensively. It is not infested with the bug, and we can grow it without the weevil ; I do not know any reason why it should not be grown. I would very much rather have the ordinary pea because the Grass Pea is a very difficult thing to cut. The vine is hard and wiry and dulls the tools that you use in cutting it, very quickly.

Dr. FLETCHER : How does it ripen ?

Mr. FISHER : I do not think there is very much trouble about their ripening. We sow them about the time we sow the other peas. My experience in growing peas has been that the early-sown peas are altogether the best. I sowed a large field once in a snow storm and had a very superior crop. What is your opinion as to a cold winter killing the Pea Weevil ?

Dr. FLETCHER : It is supposed that it does to a large extent affect them and that is the reason that the area of destruction has been so limited in Canada. I do not think it will kill them sufficiently to consider it a remedy.

Prof. LOCHHEAD : I tried an experiment some years ago. I exposed some of the weevily peas to a temperature of 20 below zero, and in every case the weevil was killed.

Dr. FLETCHER : It was not so with us, at 15 degrees below zero we exposed them in a glass bottle, and thought they were all dead, but in half an hour afterwards they became lively again.

Mr. FISHER : At what time do they mature ?

Dr. FLETCHER : If the peas are left in the field too long, there are enough shelled out to carry the weevil over. The weevil matures about the middle of August. Peas fumigated by Mr. Niles of Wellington on the 5th of August had the weevil about half grown. In very early seasons the Pea Weevil has been found during the first half of August. That is a very rare thing. On the 5th of August this year the weevil was only half grown ; on the 15th of August it was more than half grown, and by the end of August the weevil was in a perfect state. Peas left in the field are certainly a great source of danger ; they should receive special attention either by feeding them off or ploughing them down deeply.

Dr. FYLES : Do you suppose that the weevil leaves the pea on approach of winter ?

Dr. FLETCHER : They may do so. A considerable number of them leave the peas in the autumn, and they hibernate around the barn or in the rubbish heaps, and a great many of them are killed during the winter.

Mr. FISHER : It is the practice of some fruit growers to work their orchards up to the middle of July, and then sow peas, and they usually get a crop. Where I live the peas will ripen if sown in the middle of July ; the peas will also gather nitrogen and increase the fertility of the soil to a considerable extent. We also keep hogs there and if we turn a hundred hogs on twenty acres of peas in the middle of July, we find that the hogs do very well in cleaning up the pea crop and the apples that fall. They serve the double purpose of freeing the orchard from pests that infest the fruit, and of making pork.

Dr. FLETCHER : That is an excellent practice. There is no doubt that these peas would be practically free from weevil attack when sown so late, but the crop would be reduced by mildew. I should like to ask Mr. Pearce if it is not a general practice here to sow as early as possible ; because if sown late they will be affected with mildew.

Mr. PEARCE : Yes, that is the experience with farmers in this section ; late sown peas are subject to mildew, but they are freer from the weevil. A good many of the farmers here sow them on the 24th of May, but the earlier they are sown the better,—the better the sample you get, and the better the yield.

Prof. JAMES, being asked to say a few words on the subject, said : I certainly cannot add anything to what Prof. Lochhead and Dr. Fletcher have told us as to the nature of the trouble,

but I can emphasize what they have said regarding its extent. I think the evil of the Pea Weevil is co-extensive with the crop. I do not mean that it is co-extensive with the possibilities of the crop, yet there are very few sections where the pea is grown where you do not find the weevil. There are sections where the pea can be grown where you probably will not find the weevil for some time. We have been told about Manitoulin and St. Joseph Islands. Their contributions of peas to our general crops are very small, and I think at least ninety per cent. of the peas that are grown to-day are grown in weevil-affected sections. When you get to the remote sections, where peas play an unimportant part, you do not find any weevil, and I may say the finest peas I have seen in this Province came from the Temiskaming section. They were beautiful, perfectly grown peas, and there is no doubt we have, away in the east and up the Ottawa valley, sections where peas can be grown extensively for a time. The trouble is that where the great bulk of our peas are grown we have the weevil to an enormous extent, and if we give up growing peas because the weevil is here, it would mean that we have been beaten. We have never yet been brought to that position, and if we give up the fight of the weevil, we might as well retire practically from Agriculture in this Province. The weevil can be kept in check, and the whole question now is, how are we going to convince the farmers that they ought to help us in checking this evil. This is the problem that is before us, not only in connection with the Pea Weevil, but in connection with very many other things; to try and prove to the farmers, and a great many others in the Province, that they ought to do certain things in their own interest. On the face of it, it appears to be a very easy matter to say to the farmer, here is a way you can get good seed peas, and then to expect them all to drop into line and do it at once. But that is the greatest difficulty we have to contend with. There is very little use passing a law, that they must do so and so, because you cannot enforce a law unless you have public opinion at the back of it. Something must be done, and something is going to be done, and I hope we shall get here to-day some practical suggestions that will help us to solve this problem. It is certain that both the departments at Ottawa and Toronto will spend what money is necessary to fight this evil, if we can only see some possibility of success ahead.

The pea crop is a unique crop in the Province of Ontario. It is one that we cannot dispense with. It cannot be measured by the number of bushels we produce, because along with it is another great industry, that is the pork and bacon business, which to a great extent depends upon the pea crop; for to the pea crop and to the dairy industry of this Province we owe to a large extent our success in the pork and bacon industry.

Dr. FLETCHER said that there are large districts still in Ontario where there is no danger from the weevil. Peas have been sown from Newfoundland and Prince Edward Island, and occasionally these peas have, to a very small degree, been infested, but not to any extent. I think that in the case of the San José scale it will spread from its centre. The San José scale started in California, was then introduced in the Eastern States, gradually spreading from its centre, and if it had not been for the active measures adopted by the Ontario Government it would have spread throughout the Province more than it has, and the people of the Dominion ought to recognize what has been done by the Province to save them. They grow magnificent peas in Quebec, and they stopped because the crop fell off. They had been in the habit of specially treating their land to put back what they had taken from it. They stopped this and then their pea crop fell off. Some people connected with the trade find it necessary now to send to Europe to have their seed grown, and we shall lose our trade unless we wake up.

The CHAIRMAN: I think the way to reach the people would be for the Government to issue bulletins.

Prof. JAMES: They have had the information a dozen times through bulletins; they get it year after year.

Dr. FLETCHER : Mr. Carruthers has written me as follows :—" One of our largest buyers writes us that they are getting shipments from Calcutta and the quality is very fine, being free from bugs, and better than any we are shipping him from Canada. They also say they are buying them at one shilling per quarter, which is equal to 3c. per bushel, less than we are asking for our No. 2 grade of the present crop."

Dr. FLETCHER then moved the following resolution, seconded by Prof. Lochhead :—

Resolved, That the Entomological Society of Ontario request that the Superintendent of Farmers' Institutes have the matter of the Pea Weevil brought prominently before all meetings of Farmers' Institutes during the winter ; that from the discussion held this afternoon, the cessation in the cultivation of peas for two years is not the best remedy for preventing injury by the Pea Weevil, but rather the making known as widely as possible the nature of the pest, the extent of its injuries and the best remedies, and that if object lessons could be given throughout the country showing the way to fumigate peas and the advantage of doing so, it would materially help to reduce the injury by the weevil.—*Carried unanimously.*

Dr. BETHUNE : I should like to ask if it would be practicable to have some Legislative enactment to compel seedsmen to fumigate their peas. I do not think there would be the slightest use to pass an Act of the Legislature with regard to the general public, but we might get at a large proportion of the seed peas by rendering it compulsory on the part of the seedsmen to fumigate them. I know that not many years ago, in the neighborhood of Port Hope and Cobourg, and all through Prince Edward County, where all kinds of fancy peas were grown by the acre, that every seedsman had his " bug house " and fumigated all the seed, but it seems that some have discontinued that laudable practice. I was intending, before this resolution was read, to suggest that the Ontario Department of Agriculture might issue a mandate to those who attend Farmers' Institutes to make this a point of their proceedings during the coming winter, and if that were done, then if not only the Agricultural press, but the press generally, would take up this subject, and bring home to the whole country the seriousness of it, and the ease with which it really might be dealt, and if in addition to that some experiment were made upon the line Professor Lochhead has mentioned of object lessons, I believe it would have good results.

I remember when not many years ago it was impossible to get good butter in this country in the winter time. When we got butter made from our own cows in the summer time it was all right, but you could not buy butter fit to eat in the winter. That has all been remedied by this object lesson system, the travelling dairies showing the farmers' wives how to make good butter. It has been a great success, and now we can always get good butter, and if that experiment succeeded so well, I think it would be quite worth while to adopt a similar system to teach the farmers how to deal with this terribly destructive pest.

The other day I happened to notice in the market reports from the port of Montreal that the shipment of peas from Montreal up to the first of October last year amounted to 458,000 bushels. This year up to the same date it amounted to 269,000 bushels showing a decrease in one single year in that port, up to the first of October, of 189,000 bushels. This shows what the weevil has done in reducing our exports from one port alone.

I wish to ask Dr. Fletcher if there is any connection between the mildewing of peas and the Pea-Weevil. I mean in this way ; is it the case that if the pea plant is not healthy and strong and vigorous, it is far more subject to mildew than it would be if the nourishment of the plant had not been taken by the Pea-Weevil ? Would it be more subject to mildew than one grown from perfect seed ?

Dr. FLETCHER : I do not know from actual observation that that is the case but I can quite understand that the weakened plant would be more likely to be affected. Weevily seeds grow a weak plant which matures later and that would make it more liable to mildew.

Some of the seed merchants fumigate 2,000 bushels at a time by having a properly constructed building and by putting 20 pounds of bi-sulphide of carbon at the top and allowing it to vaporise, which is easily done. The peas can be left in the sack. A farmer with an ordinary coal oil barrel can put 5 bushels of peas in it and fumigate them by using three ounces of bi-sulphide of carbon, which would probably cost 15 cents.

At the present time there are very few seed peas imported into Canada ; because our peas are freer from the weevil than they are to the south of us, but directly we put any sort-of pressure on our seedsmen, then the peas will be brought in from the other side.

First of all we want to make it known as widely as we can that it is a serious injury, and then that there is a simple practical remedy, if they will apply it.

Prof. LOCHHEAD : If you compel the seedsmen to fumigate their seeds it will not cover the point, because there is a large amount of seed exchanged among the farmers themselves. The Minister of Agriculture is thoroughly in earnest in this matter. I received a letter from him early in the season, and he wished me to go about it in some way and do something, and of course he will provide the funds. The Minister of Agriculture is a thorough believer in fumigation himself, and he fumigates all his own peas, yet they have weevily peas in his district because the other farmers do not fumigate.

Mr. SMITH : I think Prof. Lochhead has got the correct idea with regard to this particular matter. Some years ago there was established in Guelph what is known as the winter fair. They established a "block test," that is, they show the animal on the hoof first, and then the animal is slaughtered, and they make another test ; that is one of the best object lessons we have in the country, and as a result of that object lesson the Wm. Davies Company of Toronto say, that in one year the quality of the bacon of this country improved 50 per cent. That was wholly the result of that object lesson, and the work done by Farmers' Institutes. If you can get the Institute men to take up the weevil, I am satisfied, you will influence public opinion in this country, and you can then enforce any measure with regard to the weevil. I have gone over the province pretty generally and I find that the evil is steadily extending north. At one time it did not go further than Lake Simcoe ; but last summer and the summer before, I found it up on the shores of the Georgian Bay and it was becoming quite as prevalent as in the frontier counties.

THE PEA WEEVIL.

By W. LOCHHEAD, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

Although the Pea Weevil (see Fig. 1, p. 4) has been known as an enemy of the cultivated pea for over 150 years in America, it is not a native. It probably came from the East, whence came so many of our cultivated plants, and their insect enemies as well. Peter Kalm, the eminent Naturalist of the last century, states that in 1748 pea-growing had been abandoned in parts of Pennsylvania, New Jersey, and New York, on account of the pea weevil.

It is apparent that the pea-growing industry in Ontario is doomed unless radical measures are adopted (by the farmers themselves) for the control of the weevil. The pest has made its appearance in nearly every county in the western half of the Province, and in the Lake Ontario counties as far east as Frontenac. The more eastern counties and those further north are not much troubled with the "bug." Durham, Northumberland and Prince Edward used to be the favorite section for growing peas for French and American seedsmen, but the depredations in

NOTE.—The above paper by Prof. Lochhead was not read in connection with this discussion, but is placed here as a matter of convenience.

these counties have been so great that the growing of peas has been largely reduced during the past two or three years. Amherst Island, which was formerly a great pea-growing district, has scarcely a farmer this year who is growing peas. Throughout Wentworth, Wellington, Waterloo and Oxford the growing of the common cultivated pea has been abandoned, and the grass pea has been substituted to some extent. This latter variety does not suffer from the weevil, but it was attacked this past summer in the counties of Halton and Wentworth by a green louse, the exact nature of which I have not yet determined.

This summer I had the pleasure of visiting the Manitoulines and St. Joseph Island. There the pea-bug or weevil is unknown. Further west, around Fort William and Port Arthur, it is also unknown, and it is the duty of the farmers of these districts to initiate strict measures to prevent the importation of the weevil.

To give an idea of the diminution in the growing of peas during the last 10 years, it may be stated that in 1891 the yield of peas in Ontario was about $18\frac{1}{2}$ million bushels. In 1902 the yield was nearly $11\frac{1}{2}$ million—a decrease of over 7 million bushels in 11 years. The decrease would have been still greater if it had not been for the introduction of the grass pea variety.

The question of treatment is a very important one, and is not a difficult one to put into practice. Unlike many other pests, the pea weevil confines its attention to the cultivated and garden pea almost entirely. It attacks no wild varieties, hence there is no danger from re-infestation through those sources. The usual method of treatment is that of fumigation with carbon bisulphide. For several years the pea-growers of Prince Edward and other Lake Ontario counties practiced this method, but there was no wide-spread co-operation in this line of treatment among the farmers. The result was that the weevil thrived in spite of the efforts of many of the largest pea-growers.

The weevil is capable of flight, and it is possible that it may fly comparatively long distances. The first essential in a plan of campaign against the pea weevil is co-operation in the treatment of infested seed, and, without this, the campaign would be useless.

The method of treatment which has been recommended is to fumigate the seed peas in airtight barrels or bins immediately after threshing. It is usual to use a pound or a pound and a half of carbon bisulphide for every 100 bushels of peas. For smaller amounts, the quantity is proportionately slightly increased. The peas are subjected to this treatment for 48 hours.

The question naturally arises: What is the best time for the treatment of the peas? To answer this question, a study of the development of the grub is necessary to ascertain at what stage the grub ceases eating the pea. Mr. Elmer Lick, of Oshawa, who is a careful, accurate observer, found that in every infested pod he examined that not more than one-half the damage to the pea was done until after the crop was ready to harvest. In many cases he found not more than one-third the damage which the weevil would do before reaching maturity. This was true of both late and early varieties, which were growing side by side. He found, however, that a larger percentage of the early crop were "buggy." Mr. Lick naturally comes to the conclusion that it is highly advisable to treat the peas immediately after harvest, and not to wait until the grub has become full grown.

Mr. Lick's conclusions regarding the treatment of peas are as follows:—

1. Do not sow buggy peas without treating the weevil.
2. Harvest the crop as soon as ripe, and thresh at once.
3. For seed peas, treat at once; but if for feed close up the concave of the machine tight; use full speed, and thus crack the peas and kill every weevil; or, if it is not desired to cut up the straw, run the peas, after threshing, through a crusher. (Mr. Lick would not care to risk grinding fine, for fear of heating).

"You must quit growing peas, unless there is co-operation in some way."

Mr. Lick thinks a great deal of coal-oil as a treatment. He uses about one gallon to 10 or 15 bushels of peas. The oil is applied in such a way that the peas are thoroughly covered.

In 1897, Prof. Zavitz, of the Experimental Department of the Ontario Agricultural College, made some interesting experiments to find the value of peas for seed which had been injured by the weevil. He found that in the case of a large variety of pea, like the Marrowfat, about three-fifths of the peas which had been injured by the weevil did not germinate. In the case of a small variety of pea, such as the Golden Vine, he found that only thirteen per cent of the peas which contained the weevil grew. Thus he says,—“If a person were sowing weevilly seed of the golden vine variety, it would be necessary to sow 15 acres of peas in order to get as many plants as would be produced from sowing 2 acres of sound seed.”

There is one interesting fact which I observed while in St. Joseph Island, which was that, although weevilly peas are sown, the weevils never make their appearance on the new crop. Whether this peculiarity will hold out many years, it is impossible to say, but such is the case at present.

The life-history of the pea-weevil is as follows: The weevils deposit their eggs singly on the outside of the newly formed pods, and when the peas are in blossom. The grub, as soon as it is hatched, bores through the wall of the pod and enters the pea. Within it, it eats and grows. When full grown, it is about one-fourth of an inch long, and about one-eighth of an inch in thickness. It has three pairs of minute legs, but otherwise it is decidedly maggot-like. Its body is wrinkled, and is beset with a few long hairs. In its pupal state, it rests for a few weeks in a round burrow, which is closed externally by the unbroken membrane of the pea. The winter is passed in the adult state, either within or without the pea, but usually within.

I venture to outline a plan of an experimental campaign against the weevil, and I would like the members present to discuss it as to its feasibility and probable value. The plan is based on the idea that if the entire pea-crop of a section is threshed and treated with carbon bisulphide immediately after it is harvested, the weevils in that section will be practically exterminated. I suggest, therefore, that a corps of men be appointed to treat the peas that are grown on every farm in a group of two or three townships. The pea-growers should be asked to assist in the work by providing the necessary barrels or tight bins for proper fumigation. To each member of the corps, there could be allotted all the farms on one or two concessions. Every farm would then be visited, and the peas fumigated properly. It might be necessary in some instances to fumigate the peas twice if there was any doubt as to the thoroughness of the first treatment.

The same plan could be followed out the second season. If the weevils are still abundant the third season, the treatment would be considered a failure, providing no weevilly peas had been introduced during the period of experimentation.

REPORT ON INJURIOUS INSECTS IN 1902.

DIVISION NO. 4.—NIAGARA DISTRICT.—BY GEO. E. FISHER.

Not being schooled in the science of entomology you will readily understand that I naturally shrink from accepting office in this society and reporting from the standpoint of an entomologist. My indebtedness to entomologists for assistance in prosecuting the San José scale investigation, a desire to reciprocate, and being assured by Prof. Webster and particularly by Dr. Fletcher that they themselves are only students and that I am abundantly qualified to act in this capacity, are my apology for attempting to do so.

The opinion seems to prevail that in continually moving about the country in my official capacity I enjoy exceptional opportunities for observation and should know a great deal. While it may not seem altogether unfair to expect considerable of me in this way, the particular work in which I am engaged has so continually demanded my full time that the opportunity for thorough and careful investigation outside of matters pertaining to the San José scale is not nearly so satisfactory as when at home I went leisurely about my own orchards and, with necessary appliances always at hand, worked out such questions.

My practice has been not to accept any statement I could not verify in the field and in my judgment he who demonstrates beyond question one subject in a whole season has accomplished much more than another who has given but superficial attention to a greater number.

Notwithstanding the almost entire absence of such weather as makes ideal conditions for insects, in many instances they were present in usual quantity. The cabbage worm, striped cucumber beetle and squash bug, asparagus and potato beetles are spoken of by gardeners as having been troublesome. The potato beetle made a record, for when the vines succumbed to blight, in their efforts for self preservation the beetles attacked almost everything else, tomatoes and particularly egg plants were protected with the greatest difficulty. There were instances of tomato plants being eaten off in large quantity, by potato bugs which attacked them below the surface of the ground, before the potatoes were up in the spring. The asparagus beetle is spread over the whole of the Niagara District, and where left to itself seriously injures the crop. There are several methods of controlling it, and those which are perhaps the most successful and most generally adopted are very simple. The insect prefers the more spindling shoots which are allowed to stand and are destroyed as soon as they become considerably infested. Little chicks catch and eat the beetles, and if moved about in portable coops a single brood will protect an area of quite large extent, when cutting is discontinued the plantations are sprayed with paris green or arsenic. A gentleman at Queenston suggests a solution of saltpetre, one pound in ten gallons of water, for the suppression of cucumber and squash beetles. Others are using whale oil soap one pound in four gallons and find that it is safe for very tender plants and besides relieving the vines of insect pests so invigorates their growth that its use is economical for this purpose alone.

CANKER-WORM.

Canker-worm (Fig. 2) was not so generally plentiful this season as last, but was still numerous in certain sections, where orchards were stripped as usual. Little rain fell during the larval period, which afforded a much better opportunity for spraying this year than last, when the almost continuous rain washed off the poison as fast as it was put on. In 1901, so unsatisfactory were the results from trying to kill Canker-worm by spraying, that in the fall a few growers resorted to the sticky bandage process. Even with the weather conditions favorable, spraying a large number of trees is a heavy undertaking, but those of 1901 showed that Canker-worm cannot always be controlled by spraying, though the pumps be kept going and the best of material used. In my own orchards, we had not been successful in the spring, and in the fall made an experiment of sufficient extent to fully test

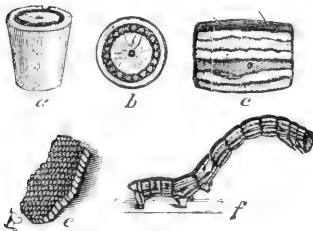


Fig. 2. Fall Canker-worm. *a* and *b*, eggs seen sideways and from above; *c*, markings on segment of caterpillar; *d*, mass of eggs; *e*, caterpillar.

this method. Beginning Nov. 1st, 2,000 apple and 6,000 plum and cherry, all bearing and mostly full-grown trees, were treated. Pear and peach were not attacked, though a few years ago a neighbor had serious trouble from Canker-worm in his pear orchard. At the above date, the weather being rather cold, pure castor oil and a good quality of resin were used in the pro-

portion of equal parts by weight ; in warmer weather five parts of resin to three of oil would be required. A space of six inches or more at a convenient height was scraped on rough-barked apples and the surface made as smooth as possible. The mixture while warm was applied to the bark with a brush, a strip around the tree two inches wide, which spread to four. The heavy bark of the apples soon absorbed this first application, which was promptly renewed. In the course of the season it was found necessary to treat the apples three times and the plums twice. A few moths were moving when the treating was commenced, and some of these no doubt had already reached the branches. As the season advanced and thousands upon thousands of the sluggish egg-laden moths became entangled in the wax, the situation was extremely interesting. On one small plum one hundred and fifty moths were counted, and on some of the larger apples the number of moths captured, both male and female, was too many to count. (Fig. 3.) During the spring a very close watch was kept, and as there was no movement, I have concluded that the infestation was wholly of the fall variety. As the males were made prisoners if their wings but touched the wax, there was little and probably no copulation, and Dr. Fletcher has explained that the eggs are likely to be fertilized only in passing the ovary. However this may be,

so far as we could observe no eggs hatched, but remained in the body of the parent still held fast by the wax. Some who used this method collected and burned the dead females, but in our case there seemed no necessity. My interest in this matter intensified as the season for spraying came and went with this innumerable host of closely-held captives on the trunks of the trees and no larvæ in the top to spray. The men say there were not as many worms in the entire orchard this year as were on some individual trees last year. This way of treating Canker-worm is not new, but is certainly not generally understood. Mr. O. T. Springer, of Burlington, who has practised this method successfully for years, assisted me with valuable suggestions.



Fig. 3. Fall Canker-worm. *a*, male moth ;
b, female moth.

PEAR PSYLLA.

Early in September my attention was called to an attack of Pear Psylla in an orchard belonging to Mr. Joseph Tweddle, of Fruitland. A block of 125 eight or ten-year-old pear trees was involved. The varieties affected are those in common cultivation, the Bartlett's suffering most. Nearly the whole of the block was swarming with wasps, attracted by honey-dew that was dripping from the foliage. The wood was covered with a black fungus which had developed in honey-dew exuded by nymphs attacking the wood.

At the time of my first visit the foliage was largely deserted and the nymphs were concentrated on the wood, particularly the young growth, and the energy of the trees was apparently so reduced as to seriously affect next season's crop, no matter what treatment is given. Some years ago Mr. Freeman, of Freeman, lost an orchard of nearly four hundred large dwarf Duchess from Psylla. He tried to destroy the insects with kerosene emulsion, but used it of too little strength, which had no effect whatever. At home we always have some Psylla, but it is never there in sufficient quantity to necessitate treatment.

In the worst affected portions of Mr. Tweddle's orchard the foliage was so reduced as to make treatment easy, and I advised an application of crude petroleum emulsion, 1 in 10, which would kill nearly all of the nymphs and stop the drain on the trees. We subsequently treated a couple of the trees with the emulsion ourselves, and the effect was even better than I anticipated. This, followed by a thorough treatment with lime and sulphur in winter, will subdue the pest. As the eggs are deposited very early in spring, the winter treatment should not be delayed too long.

WHITE ROSE-SCALE.

This insect has taken to our Raspberry plantations and seems to be widely spread. In fields situated east of Grimsby, it was found in good form both at the beginning and end of April. On the 10th of May it was rapidly increasing in size and by the 20th nearing maturity, but down to this date no eggs had been observed. On May 31st eggs were plentiful and on June 7th were found to be hatching; on the 23rd June eggs were still plentiful, hatching and larvæ fixing on the old canes; at this date the scales were present in all stages of development. These fields were not seen again till September 22nd when eggs were more plentiful than at any previous examination, lice running and fixing on both old and new wood and there were growing scales in all stages particularly on the old canes. The same conditions prevailed on the 25th of October except that the new canes were then heavily infested.

It appears from these investigations that while this scale resembles scurfy barklouse in appearance it differs from it in being multibrooded and in passing the winter alive. I intend making a careful search for eggs at the end of the season to determine whether or not there are eggs in good condition at that time, as the opinion is held that some of the eggs winter over. On September 22nd there were very few scales on the young wood in comparison with the old and not many of these were of advanced growth. If the old canes be removed and destroyed immediately after fruiting much of the spreading will be prevented as it is no doubt later in the season, when larvæ are more plentiful, that most spreading occurs. This precaution followed by a thorough treatment before growth starts in the spring with a suitable wash such as soap, crude oil or lime and sulphur will in my judgment meet the difficulty.

SAN JOSE SCALE (Figs. 4 and 5).

Owing to the cold late spring the larvæ of the San José scale did not appear till a week or ten days after the usual time, but notwithstanding this and the unfavorable weather which

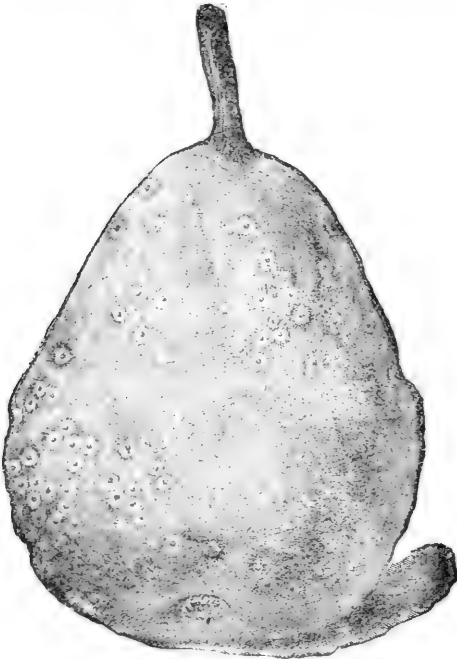


Fig. 4.—Pear infested with San Jose scale.



Fig. 5.—Portion of a branch infested with the San Jose scale.

followed, reproduction was rapid and the pest was discovered in many orchards where it had not previously been found. In many instances trees that were but slightly infested in the spring are encrusted now and likely to be ruined before the end of the season.

Formerly the practice was to mark for special winter treatment any trees that were badly attacked in summer, but this was not satisfactory as such trees frequently became much weakened and sometimes died before the winter's frosts closed the scale's season.

Recognizing the necessity for prompt summer treatment in such cases much pains were taken to procure an effectual remedy suitable for summer use which would destroy the scale without injuriously affecting the trees. In a long series of experiments emulsions made from kerosene and crude petroleum proved the most satisfactory and are really very useful. The varying results so commonly reported from the use of kerosene are largely due to differences in preparing the emulsions and of the condition of the weather when the applications were made. They should be applied only on warm, dry, bright, airy days, and it would appear that the hotter and dryer the weather is the better will be the result in killing the scale and the safer to the trees. Spraying done on trees in leaf is necessarily imperfect for the foliage prevents the spray reaching every part of the wood, particularly the twigs. For spraying infested trees in leaf we prefer a rather coarse nozzle which sends its spray through the foliage to the wood much better than a fine nozzle. The oils resist re-attack so well that even if there be considerable breeding after the treatment is given it will not matter, for the majority of the young scales which fix will die and the tree will not be badly affected again during the season. Either kerosene or crude petroleum may be satisfactorily applied with a combination pump and diluted with water to almost any percentage, but to use them with an ordinary pump it is necessary to make an emulsion. Kerosene emulsion 1 in 6 is a suitable strength for hardy foliage and 1 in 7 for peach and other tender foliage. That is one gallon of kerosene in a total quantity of seven gallons of emulsion. Crude oil emulsion 1 in 10 is a suitable strength for hardy foliage. This gives one quarter of a pound of soap to the gallon of emulsion and ten per cent. of oil which is all most foliage will resist. Kerosene is preferable for peach trees. I would spray only badly affected trees in summer and follow this with a thorough spraying of the entire orchard with lime and sulphur in the winter or spring.

Our experiments clearly demonstrate that lime and sulphur is altogether the most effective remedy we now have. It is also the cheapest and the safest. It is easily applied and we hope by utilizing steam from ordinary threshing engines for cooking to make it more easily procured than any other spray. A larger proportion of lime and sulphur than is necessary in California is recommended for our climate. One pound of lime and one-half pound of sulphur to the gallon of wash giving the best satisfaction in our experiments. We found no advantage from the addition of salt, in fact the best results were obtained where no salt was used, and as it seriously corroded the pump we do not recommend it.

It will be interesting to this meeting to know how this remedy appears to work out, and as frequent examinations were carefully made, I may speak with considerable confidence. There were so many living, healthy, developing females remaining that in the early examinations we pronounced the treatment a failure. When the breeding season came we were greatly surprised at finding no larvae on treated trees and the little yellow lice simply swarming on trees that were not treated. The microscope showed the mature females on untreated trees to be packed with young, while the large, fresh, oily females on treated trees were empty, barren and entirely without any appearance of young about them. The proportion of males in the over-wintered brood is largely in excess of the females and this is nature's provision for complete fertilization in the spring which no doubt is indispensable. The males being on the surface and exposed perished from the treatment, and many of the females protected under layers of encrusted scales escaped, but as there was no copulation there was no breeding.

A most gratifying feature of our work is that it shows clearly that the scale may be easily controlled and the vigor of an orchard maintained independent of surroundings. An orchard exposed to reinfestation is of course at a disadvantage, but even this will not prevent holding the scale well in check if regular annual treatments are given.

And now that these results are secured, fruit growers and particularly those in infested sections, will appreciate the Minister's persistent effort in their behalf, and we trust such thorough use of the remedies will be made as will speedily bring the pest well under control.

Dr. FLETCHER : Said that he was glad to be able to confirm the results obtained by Mr. Fisher in the case of the San José scale.

He had just been through the scene of these experiments with Mr. Fisher and Mr. Gibson, and saw these very trees that were treated with lime and sulphur, and they were just as healthy as trees need to be. The scale was very abundant at the beginning of the season, but now there are only a very small number of living scales there, which shows that this remedy is very effective. The treatment does not cost more than it is worth, and the application of it is useful in more ways than one, because it destroys many other injurious insects, and we have in it a remedy which comes next to the Bordeaux mixture. Lime, sulphur and salt is one of the very best fungicides we know of and when we find that it is one of the best and cheapest applications for destroying the San José scale, and at the same time will remove many other diseases that affect the tree, we should appreciate the efforts of the men who have given us this remedy.

Until the San José scale was introduced into Ontario, our greatest loss was from the brown rot of the plum, and the black spot of the apple. Mr. Evans has a specimen that he is going to show to the meeting, which will illustrate how reports come back from European markets of the fruit we ship. The farmers ship them in comparatively good condition, they only see a small amount of spot upon the apple. This sample will show you what condition these apples are in when they reach the European markets. What does this mean, it means that the fruit growers have not taken the proper care to properly treat their trees ; these apples were shipped in comparatively proper condition ; but the shipment was delayed for three weeks and this is the condition in which the apples were found. [Apples were exhibited which were so spotted and pitted with rot as to be absolutely unmarketable, and yet they were shipped three weeks before in an apparently sound condition.]

Prof. LOCHHEAD : I can assure you there is no person more pleased than I am, at the favourable results of Mr. Fisher's experiments.

Any person who has had anything to do with the San José scale knows the destruction it creates. The question is often put to the Entomologist, what are you here for if you can't get rid of the scale ?

Mr. Fisher was with me at the Pittsburg meeting of Economic Entomologists and I can assure the members here, that we are ahead of the United States as far as the treatment of San José scale is concerned. Although they reported the results of the lime and sulphur treatment, there was a good deal of divergence of opinion at that meeting.

Mr. FISHER : There seems to be some difficulty in cooking this mixture properly. The lime and sulphur preparation requires a great deal of cooking. Two hours are absolutely necessary and three hours are better than two. I am not a chemist and I cannot explain the trouble from a scientific stand point. Our practice has been to put a quantity of water in a kettle and bring it to a boil, we then put the lime into the boiling water, and as soon as we got it slaked, we threw in the sulphur. The slaking of the lime seems to have a good effect in reducing the sulphur. This is cooked for two hours. When the sulphur is first introduced into the lime, the mixture is of a light silvery color and it remains about the same color during the first hour and a half, then it begins to shade away to a dark deep amber, and some that we cooked longer became a greenish color and had quite a green cast. If the mixture is properly made you cannot wash it off the trees, nor can you wash it off your hands, if you get any on.

When it becomes cold the lime and sulphur appear to crystallize and we have water and crystals, but we cannot stir it up neither can we restore it to life by cooking, and it will not stick when we put it on the trees. The preparation must therefore be applied while hot.

THE CHAIRMAN: After it is in condition to apply to the trees, how long before it crystallizes?

MR. FISHER: As soon as it gets cold; it would probably take half a day to cool. There is no trouble in getting it on after it is prepared, if you are not interrupted.

MR. W. E. SAUNDERS: As regards the chemical nature of this compound, it might be of interest to state that when the lime and sulphur are combined together, they make sulphide of calcium, and sulphide of calcium freshly made is soluble. It has been in use in the drug business for a long time as a remedy for skin diseases, and I have found that in the strength which we make it, which results in a bright brick-red solution, it does not crystallize. I should think that the crystals occur from making the solution too dense. We have a solution in stock now, that has been made for perhaps three months or six months and it is still of a deep orange-red color; it contains sulphide of calcium and probably some sulphur. This solution we have bottled up and it is in good condition to-day. When it is exposed to the air it forms upon the surface a flake of a mixture of sulphur and sulphide of calcium. Decomposition, no doubt, will go on to a more rapid extent as it is exposed longer to the air. I should think that by putting this material in barrels, filling them right to the top, and putting the plug in the bung, it could be kept for weeks. If you have more sulphur than the solution can take up, it might possibly take it up while hot and throw it down when cold. If it had an excess of either one it might leave the residue in the bottom.

MR. FISHER: We have very little sediment; the mixture appears to be perfect. We did have a lighter wash, but it left the sulphur exposed, so that it would be blown away by the wind or washed off by the rain, whereas by using a pound of lime and half a pound of sulphur to the gallon of wash, it left the sulphur covered. The sulphur seems to be deposited between the lime and the bark of the tree.

PROF. LOCHHEAD: I had a talk with a chemist at the Pittsburg meeting and he stated that when you boil sulphur and lime together, you get various kinds of sulphide of calcium. There are sulphides of a high and a low degree, and these differ very remarkably.

PROF. JAMES: This is one of those things where the practice is of far greater value than the theory. We all know that the various forms sulphur assumes depend entirely upon the temperature to which it is heated. The use of the lime and sulphur mixture for the treatment of the San José scale in the eastern part of California has presented a very interesting feature to me. Perhaps most of you know that in the early days this favorite stand-by, or method, used in California was used here, but we were told by the American Entomologists that it was not at all applicable to the eastern part of the continent. It is quite evident now that our American friends came to a conclusion too rapidly, because when Mr. Fisher's department used that treatment he wrote to a large number of the Entomologists on the other side, and in their replies they admitted that their previous conclusions were hardly correct. Mr. Fisher has practically shown them the way in this matter, and I think we can safely say that his experiments are in advance of anything that has been previously done in the Eastern States, or the Eastern half of the Continent. The only way in which they can be said to have gone beyond us is in the very important work done at the Department of Washington, in sending to China and Japan for the natural parasites of the insect. It seems that after trying many experiments, we have got out into the light and are now where we have some safe and sure footing with regard to this insect.

DR. FLETCHER: With regard to what Prof. Lochhead has said, that this work was shown to be of great importance at the Pittsburg convention, the suggestion has been made that our

work was as good as any in the United States. We can say that it is better than anything that has been done hitherto, and more than that, it is far more extensive than anything that has ever been done in the United States. During the last four years Mr. Fisher has been working continuously throughout the summer. The best work done in the United States has been done by an Entomologist who has a class to teach and other work to do, whereas, Mr. Fisher has given his whole attention to the work and we have these good results.

If a thing is worth doing and it will pay to do it, our farmers will do it. Seventeen years ago there was not a spraying machine in Canada, and now there are more than a million, because the people have been shown that it pays to use them. And so it will be with the treatment for the San José scale.

Dr. Fletcher then moved, seconded by Dr. Bethune, "that the Entomological Society of Ontario have watched carefully the efforts of the Hon. the Minister of Agriculture and his Officers to discover a practical remedy for the San José scale ever since its first appearance in Canada, and the Society now feel that they can justly, and they do hereby, tender their congratulations to the Minister for the excellent results which have been obtained through the discovery of a practical remedy for this most destructive insect."—*Carried unanimously.*

The CHAIRMAN: It is very great gratification I am sure to us all that a member of our Society, and one of its Directors should have accomplished the very good work that he has done; we also feel that an immense deal of credit is due to the Minister of Agriculture for the thorough way in which he has caused these investigations and experiments to be conducted in the face of a great deal of opposition. We feel grateful to him for what he has done, and also to his officers for their excellent work.

EVENING MEETING.

A public meeting of the Society, to which the members of the London Horticultural Society were specially invited, was held on Wednesday evening, October 29th, in a lecture room of the Normal School, by kind permission of Principal Merchant. At 8 o'clock the meeting was called to order by the President, the Rev. Dr. Fyles, who said:

Ladies and gentlemen we are happy to meet you again to talk of the beautiful objects in which the Society is interested, and to tell you of some facts concerning them. I beg to request Prof. James to take the chair this evening.

Prof. James: Mr. President, ladies and gentlemen, I accept very readily and very willingly the invitation of the Entomological Society to occupy the chair on this occasion; partly because of the high appreciation I hold of their work, and partly also because we of the Department of Agriculture who are more intimately related to that work, get from them so much assistance in connection with our own work. We have been holding a session this afternoon, and have been discussing two questions in particular. They are of very great moment to the people of this Province. We have been discussing very small things indeed. Things so small that in order to be detected, in some cases at least, they must be put under a powerful microscope. These small things mean a great deal in connection with the development of this country; they are the Scale insect that affects our fruit trees and the Weevil that destroys our pea crop. If the Society had done nothing else in connection with their meeting, but to prepare for publication the information that will be collected, then they will not have met in vain.

It is not many years since Entomology was looked down upon. It is only within the last few years that it has received that attention which it deserves, and I am afraid that even yet Entomology in most of its departments is not receiving the recognition it fully deserves. We

are finding more and more enemies to our crops, and as they come before us we turn to the specialists, those who have made a special study of Entomology, and apply to them for help and assistance, and as these men put into practice the results of their investigations, the people as a whole are coming to the conclusion that after all these men are not merely men of theories but are men of practice, and I think we shall find in connection with this Entomological Society that theory and practice are working hand in hand as effectively as in connection with any other society organized for the general welfare of this Province.

Entomology is a subject which is not only of very great consequence to me, as these two crops I have mentioned will give evidence, but it is a subject of very great interest. It came out in discussion this afternoon that the pea crop of this Province during this past year was worth from four to seven million dollars less than it was about ten years ago. This falling off in production is to be attributed to the destructive work of a minute insect. If our entomologists can give us a simple remedy whereby the ravages of this insect can be overcome, you can understand how very practical their work must be.

We have not a very long programme to lay before you this evening, but I think that you will find that what we have to give you will be full of interest.

I have now very much pleasure in introducing to you the Rev. Dr. Fyles of Quebec.

Dr. Fyles then read his presidential address and illustrated it with a series of beautiful diagrams, the work of his own hand.

INSECT LIFE.

By REV. THOMAS W. FYLES, D.C.L., F.L.S.—PRESIDENT.

The old Roman poet, Lucretius, made known, in lofty strains, his ideas upon Natural Things. His poetry was better than his philosophy. He held the opinion that the soul of man was diffused in atoms throughout the body. He argued that if, on the death of the body, any of these soul atoms remained in it, the soul could not properly be accounted immortal, because it suffered diminution. But, he continued, if the soul left the body with all its parts entire, how do you account for the boneless, bloodless creatures that are found in, and upon, the carcass? He seemed to think that the soul particles could embody themselves anew in different ways. If Lucretius had been an Entomologist, and had known the life histories of the Silphidæ and Muscidæ he would not have entertained opinions so absurd.

The great question of Life baffled him, as it has baffled many a philosopher since.

The boys, at the school I attended as a child, pointed out to me a celebrated surgeon, a lecturer on Anatomy, who, they said, was endeavoring to find out the nature, and the seat, of life. We regarded him with awe; but he never made the discovery—he died, and his place knew him no more.

Distinct from the highest meaning of the word Life, the Theological meaning, which we understand in our Saviour's declaration, "They would not come unto Me that they might have life," the word is used in various senses. It is used to denote:—

I. Vitality—the power by which we live and move and have our being.

II. The period between birth and death.

III. Energy, vigour; as in, He is full of life.

IV. The condition and habits of life; as high life, low life.

V. A multitude of beings; as the city teemed with life.

VI. A life history.

There are other meanings, but these will suffice for our present purpose.

With the term *Insect Life* we are very familiar. The late Prof. Riley conducted under it, as a title, a publication which is highly valued, as a very treasury of Entomological information. Let us, in our consideration of *Insect Life*, transfer to it the meanings above enumerated.

I. And first as to the vital power. Of this it may be said that, as in the case of man, so in that of the inferior creatures, no physiologist has ever been able to make plain to us its nature and its seat. We speak of certain organs as vital organs; and we are able to trace the respiratory, digestive, nervous, muscular and reproductive systems; but the grand power that brings all into play remains a mystery. It came from God; and, when He taketh away the breath of His creatures, they die and return again to their dust.

What is the first and ordinary indication by which we judge that an insect is alive? It is *its ability to move*.

We notice on a Basswood an appearance as of a triangle of small twigs, some brown, some green. We examine it closely and perceive that we have an object before us with a head, and a trunk, and jointed limbs. Is it alive? The creature stretches out a limb, and we know that it is alive. It is *Diaperomera femorata*, Say. Fig. 6.

Again we see on a twig a small creature that in build resembles a Guinea-fowl with head and neck extended. It is brown and hard, and might, you think, be taken for a thorn. Suddenly it springs out of sight. You might say

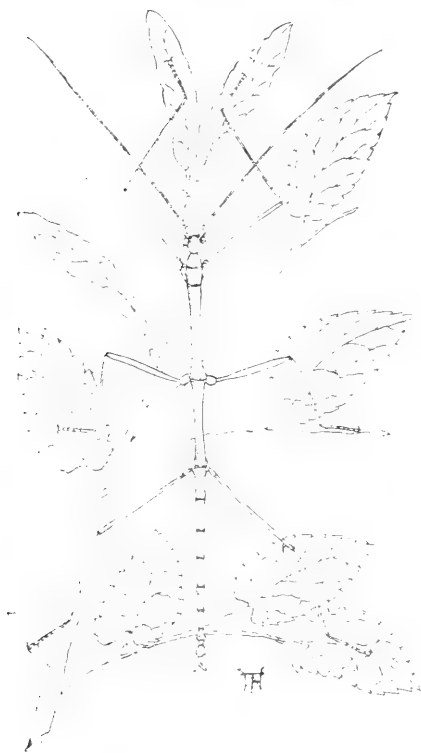


Fig. 6. Walking-stick insect (original).



Fig. 7. Leaf-hopper, much magnified (original).

of it, as old John Willett said of May-pole Hugh, "You look, and there he is: you look again, and there he isn't!"

Or again you see a piece of bark, as you suppose, projecting slightly from the boll of a tree. It is brown and ridged, and has marks as if, at some time, a small twig on either

side had been broken off. You give it a poke, and it swerves ; and some small feet are protruded ; and you perceive that it is a living moth (*Calocampa curvimacula*, Morris).

And once more, you notice a seeming patch of lichen on a birch-tree. You approach to examine it ; when suddenly, from beneath the deceptive fore-wings, a pair of gorgeous scarlet secondaries are displayed ; and the creature flies off to a place of security. It is *Catocala parta* Guen. Fig. 8.

How rapid the nervous action—how great the muscular force, that can carry the frog-hopper out of reach, that can display, and set in motion, so effectively, the ample wings of the moth !

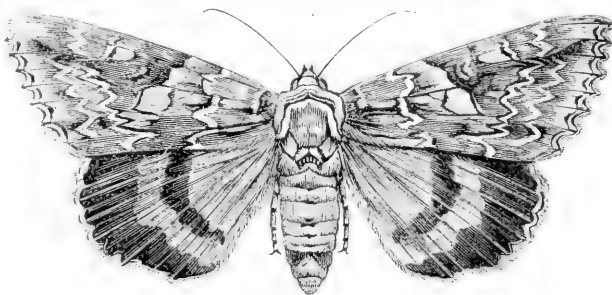


Fig. 8. *Catocala parta* (Red Underwing Moth).

There is a beetle (*Limulodes paradoxus*, Matth.) so small that it looks like the dot that we place over the letter *i* ; yet it is gifted with nervous and muscular forces according to its need ; and we can—

—“ trace in nature's most minute design
The signature and stamp of power divine,
Contrivance intricate, express'd with ease,
Where unassisted sight no beauty sees,
The shapely limb and lubricated joint,
Within the small dimensions of a point,
Muscle and nerve miraculously spun,
His mighty work, who speaks and it is done,
The invisible in things scarce seen reveal'd,
To whom an atom is an ample field.” *

In the progression of caterpillars a remarkable phenomenon may be witnessed. If a semi-translucent caterpillar be placed, when in motion, against the light—as upon a window pane—there will be observed a backward muscular action, within the body, which takes the appearance of a succession of wavelets passing from segment to segment, from the head to the farther extremity. It is owing to from ganglion to ganglion the muscles that set the the real advance — the forward movement.



Fig. 9. *Iulus multistriatus*.

the nerve power passing and acting, in order, upon legs in motion and cause backward flow causes the

When an *Iulus* is in motion, you see each pair of its numerous legs move forward in succession with the utmost regularity. (Fig 9.)

Respiration, and the reception, digestion and assimilation of food are as necessary to the life of the insect as they are to the life of man : and the insect is provided with organs admirably suited to carry on these functions, and with others according to its need.

II. We may call the period of the insect's existence its *Life*.

Insect life in this sense is made up of four successive stages—the *egg*, the *larval*, the *prepal* and the *imago* stages.

Some kinds of insects pass through all these rapidly, as for example, the House Fly. With it, the egg stage lasts only twenty-four hours.

The following table, which I have made up from the last five completed volumes of the *Canadian Entomologist*, will give an idea of the usual length of the egg stage of insects :—

<i>Colias interior</i> , 6 or 7 days, Lyman, Vol. XXIX., No. 11.
<i>Epirranthus obfirmaria</i> , 13 days, Fyles, Vol. XXIX., No. 11.
<i>Brephos infans</i> , 8, 9, or 10 days, Brainerd, Vol. XXIX., No. 11.
<i>Trigonophora periculosa</i> , 10 days, Fyles, Vol. XXXI., No. 2.
<i>Euprepia caja</i> , 9 days, Gibson, Vol. XXXII., No. 11.
<i>Arctia phalerata</i> , 7 or 8 days, Gibson, Vol. XXXII., No. 12.
<i>Xylina Bethunei</i> , about 14 days, Lyman, Vol. XXXIII., No. 1.
<i>Phlyctænia ferrugalis</i> , 14 days, Fletcher & Gibson, Vol. XXXIII., No. 5.
<i>Arctia virguncula</i> , 7 or 8 days, Gibson, Vol. XXXIII., No. 12.

The most remarkable egg period that has come under my notice is that of *Pamphila Manitoba*. The egg stage of this insect lasts for eight months. In the year 1894, on the 8th day of August, I witnessed the laying of a batch of the eggs. On the 20th day of April, in the following year, I saw the tiny larvæ bite their way to freedom from the shells in which they had lived so long. The other stages of the insect's life were completed within four months—in less than half the period of the egg stage.

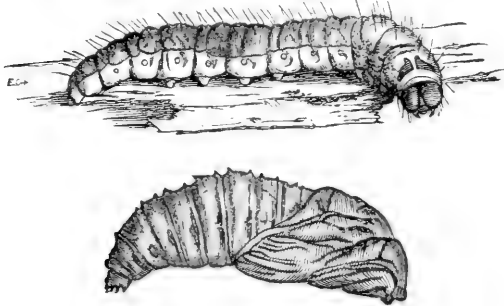


Fig. 10. Caterpillar and Chrysalis of a *Cossus*.

The larval period also varies in different species. It is the insect's feeding time. In the case of a *Bombyx*, it is the time when sufficient nutriment must be assimilated, to sustain the insect through all its after existence. Some larvæ are quickly "full fed," and go directly after into chrysalis. Others spend the Winter in a state of torpidity, and complete their growth in the Spring. Such, for instance, are the larvæ of *Melitæa Harrisii* Scudder. These are gregarious in the Fall, and may

be seen apparently tangled up in dirty-looking webs upon the heads of the White Aster. When disturbed they strike an attitude, and seem to be all legs. In the Spring they scatter, and feed up on the young shoots of the plant. The butterflies from them appear in June. Their life is completed within a twelvemonth.

But with the *Cossidae* the larval stage is greatly prolonged. Packard has given illustrations of *Cossus Centerensis*, Lintner, in which the appearance of the larva is shown after a growth of four months, of a year and four months, of two years and four months, and of three years, when the caterpillar was ready to pupate. (Fig. 10.)

But the most extraordinary prolongation of insect life is that of *Cicada septendecim*, Linneus (Fig. 11). This creature, as its name implies, is seventeen years in attaining perfection. In length of life it stands alone amongst insects.

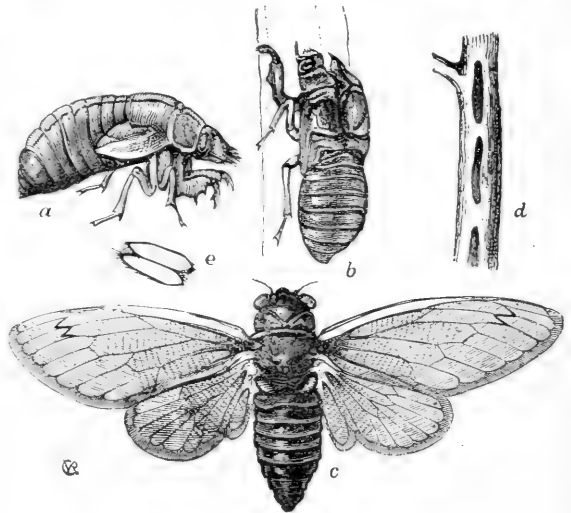


Fig. 11. *Cicada septendecim*. a, larva; b, pupa case; c, perfect form; d, eggs deposited in a twig.

III. The energy of many species of insects is surprising—they are full of life. In some cases, as in that of the mosquito, they are—as the little girl said of a troublesome puppy—“*too much alive.*”

On the 22nd of June of this year, I was staying at the beautiful country house of the Honourable Richard Turner, on the Island of Orleans. I looked from my bedroom window early in the morning—it was a bright, sunny morning—and lo, the air was full of light gauzy forms sporting around the trees on the lawn and over the tops of them. There were myriads of the creatures; and all day long they kept up their mazy dance, seldom alighting to rest. They belonged to the species *Ephemera simulans*, Walker. The wings of this species are spotted with brown, and are strengthened with an exquisite net-work of “nerves.” The long waving tails of the insects add grace to their movements. (Fig. 12).

If I may, I will here mention an episode, that was narrated to me by the much esteemed Editor of our magazine, Dr. Bethune. Some years ago, an alarm of fire was raised in the town in which he then resided. The fire-engines were called out and there was a great commotion. From the roof of a large warehouse, near the water, volumes of

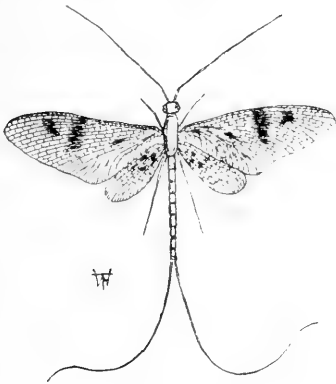


Fig. 12. (Original.)

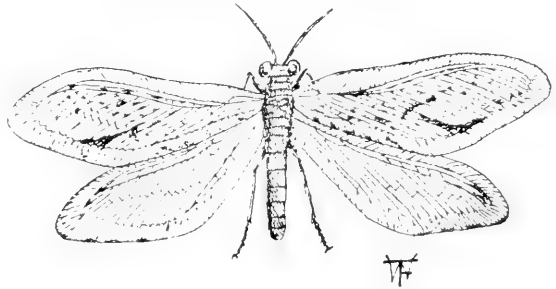


Fig. 13. (Original.)

seeming smoke and heated air were rising and eddying. On reaching the building the firemen found that they had been misled, or, as the boys would say “sold.” The appearance that had alarmed the town was caused by innumerable specimens of *Polystichotes punctatus*, Fab, rising from, and sporting over, the roof. (Fig. 13.)

Often during the time I lived in the Eastern Townships, when driving home in the calm summer evenings, I noticed above the top of some giant monarch of the forest, a mysterious moving column just discernible against the pale after glow of the sunset. The appearances were due to assemblies of insects, taking their pleasure in the heights.

Who has not noticed the dash with which the bee comes suddenly out of the blue and alights upon the foot-board of the hive, as if, like the clown in the pantomime he would say, “Here we are again!”

That energetic little fellow the Flea, *Pulex irritans*, Linneus, can leap thirty times its own height.

Who has not admired the persistence with which the bot-fly, *Gastrophilus equi*, Linneus, keeps up with the trotting horse and hovers around its legs, till opportunities occur of attaching its eggs to them.

It is the cold breath of approaching winter that robs the insect world of its energy, that takes the life out of it. Apropos of this, “The Duchess” in her story entitled “Her Last Throw” has a little piece of quiet fun. One of her characters, Fay, is speaking:—

“Her voice annoys me. It is so slow—so *drawlly*. It is irritating. It is lifeless. She talks as though she were a fly in October.”

“Captain Severn laughs rather constrainedly.

"Oh! And is it in October flies talk? says he. How interesting! After all, the one subject never quite mastered is natural history. It is always full of surprises."

If flies do not talk, they have some mysterious mode of communicating with their kind. One evening, when I resided in England, returning to my home I noticed a number of large handsome moths fluttering around an out-building. I looked about and saw others, coming from all quarters, and as far as the eye could see. I recognized them as males of the species *Lasiocampa quercus*. Presently it occurred to me that a female of the species might have come from a cocoon in my insect breeding cage. I opened the door of the out-building, and—in flocked the moths. So intent were they upon paying their respects to the lady moth, who was really within, that they flew into my hands as I undid the gauze covering of the cage. What called them? A voice unheard by man—a subtle effluvium—or emanations yet more strange? We know not; but they came from far and near, full of life and energy. The female chose her mate; and the rest fluttered disconsolately away, or fell inertly to the ground.

IV. The term life is applied to the habits and mode of living. We say, what a strange life to lead!

The Broad-leaved Aster (*Aster macrophyllus* L.) grows in patches of considerable size in the woods around Levis. In the month of June of this year I noticed that many of the large ground leaves of the plant were folded over, from both sides, and crinkled. On opening one of them I found that a larva had turned the leaf into a cool and pleasant tent for itself, and was feeding upon the parenchyma of the leaf.

This larva was about nine lines in length, and was of a pale green, with dorsal, sub-dorsal and side lines of darker green. The head and second segment were jet black and glossy. The fore-part of the third segment was dull brown—on the after part of it were four conspicuous white patches. At intervals, along the sub-dorsal lines, and elsewhere on the body, were round jet black dots. The spiracles were black. The under side of the larva was pale green. The claspers and anal segment were marked with black.

On June 25th the larva span a capsule-like, white cocoon, open at one end, for the exit of the moth. Its plan was to place itself on the under side of a fresh leaf, upon the midrib; then to affix its threads at a certain distance on either side of the rib, and to draw so much of the leaf as lay between, into a fold or crease. Within this it formed its cocoon.

The moths appeared on July 10th. The insect measured when displayed ten and a half lines across. Its body was four lines in length, and its antennæ three lines. The palpi were dark brown, turned back usually. The basal part of them was spindle-shaped; the terminal point was smaller, long and pointed.

The fore-wings were brown, clouded with darker brown towards the hind margin. They had a sub-terminal line of paler brown spots bordered with black. Beyond the centre of the wings was a pale brown horse-shoe like mark, not very distinct.

The secondaries were grey with a lighter well-marked sub-terminal line, and a grey fringe. The body was tufted at the extremity. The tarsi were ringed with white.

Professor Fernald tells me that the moth belongs to the genus *Trichotophe*, Clem. He does not know the species. I think it probable, therefore, that it is unnamed; and I venture to give it the provisional name of *Trichotophe Levissella*. Its life is a curious one.

I have raised from this species the parasite *Hemiteles mueronatus*, Prov.

The mode of life of a Tortoise Beetle that has lately made its appearance in the neighborhood of Quebec is a remarkable one. The larva feeds on the burdock and the thistle. It moulds its exuviae and dejecta into a screen which it supports over its body by means of its forked tail—thus disguising itself from its enemies, and sheltering itself from the hot sun. When it goes into pupa it cements itself to the leaf. The pupa is brown and drab, and, round

the abdomen, is set with white branched spines. The perfect insect is a pretty pea-green, shield-shaped beetle. I have described it in the *Canadian Entomologist* for this month.

The Syrphus flies (Fig. 14) lead a remarkable life. Their larvæ come from eggs laid upon plants on which aphides abound. They are blunt at one end and tapering at the other, and they have powers of extension and retraction (Fig. 15). They drive their sharp mouth organs into the aphides and suck them dry—as a boy might suck an orange—rejecting the skins. They spend the pupal period of their existence in curious hunched-up cases. The flies are handsome. They sustain their life upon the nectar of flowers, and they may be seen upon the heads of yarrow as late as the beginning of October. There are several species of them.

One day in September I was examining the blossoms of the Turtle-head (*Chelone glabra*), and admiring the beautiful gothic arches formed by the curved stamens and the flocculent anthers. I noticed that the pistil of the blossom extended over these and was bent down in front of them so that it would come in contact with intruding insects and be charged with pollen that they conveyed. I looked round to see what insect would venture to open that Turtle-mouth and tread that arched way. A movement in one of the blossoms arrested my attention and I saw that there was an insect within. So busily engaged in the recesses of the flower was this spoiler that I was able to pluck the blossom and put it and its occupant into a box that I had ready.



Fig. 14.—Syrphus fly.



Fig. 15.—Syrphus fly larva sucking out the vital fluids of an aphid.



Fig. 16.—Lace-winged fly.

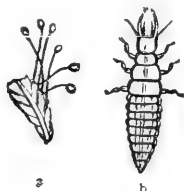


Fig. 17.—Lace-winged fly, eggs and larva.

On reaching home I found that the fly was *Syrphus Americana*, Wied. The Syrphus fly is a beneficial insect—it leads a useful life.

V. We say that the plant is teeming with life, meaning that numerous living things infest it.

At Montmorency, on the 30th of July, I noticed something peculiar in the plants of *Eurotia biennis*, L. that abound there. Instead of growing in a graceful spike, the flower-buds were crowded in a flattened mass. I plucked a number of the heads and examined them at leisure. They were alive with aphides, and preying upon these were larvæ of the Lace-wing fly (*Meloma Slossonæ*, Banks) (Figs. 16 and 17) and larvæ of four kinds of Syrphus flies, viz., *S. arcuatus*, Fallen, *S. Americanus*, Wied., *Platychirus quadratus*, Say, and *Sphærophoria cylindrica*, Say. I also found in them caterpillars of the noctuid *Alaria florida*, Guenée, and of a beautiful little Tortrix that is new to me. From the aphides I obtained some minute Proctotrupids.

Another plant that abounds with insect life is the Golden Rod (*Solidago Canadensis*, L.). At the summit of the flower-head works the larva of *Pedisa Scudderana*, Clem. In the stem are found the hollow galls of *Gellechia gallo-solidaginis*, Riley, and the pithy galls of *Trypeta solidaginis*, Fitch. In the leaves are the disks caused by the fly called by Osten Sacken, *Cecidomyia carbonifera*. These three last named species are liable to the attacks of parasites. Among the blossoms of the plant lurks the Hemipteron *Phymota erosa*, Linn. awaiting its prey; and numbers of butterflies, moths, bees and flies resort to the plant—it abounds with life.

One of the most remarkable assemblies of insect life that I have witnessed was on the walls of an electric power-house at Cote St. Paul, Montreal. The building was close to the

Lachine canal and near the aqueduct. Low down in front of the building was an arc light. Attracted by this was an innumerable company of Neuroptera. Both the variety of species and the number of each kind were surprising. It was a calm, soft evening, a very gala time for the Neuroptera. In the assembly were the beautifully striped *Macronema zebratum*, Hagen, the elegant *Setodes exquisitor*, Walker, with its golden spotted border, and the diaphanous *Chloroperla bilineata*, Say.

VI. By the word life we sometimes understand a life history.

Scattered through the pages of the *Canadian Entomologist* will be found many life-histories of various kinds of insects. They may not, by the general reader, be deemed as valuable as "Plutarch's Lives," or "Walton's Lives"; but to entomologists they are deeply interesting; and we gladly welcome every addition to their number.

Among the most wonderful of the insect life histories I have read, are those of *Hormaphis hamamelidis*, Fitch, and *Hamamelistes spinosus*, Shimer. They appear in "Technical Series, No. 9, U.S. Department of Agriculture," and are written by Mr. Pergande. The creatures whose lives are recorded are two species of plant-lice inhabiting both the witch-hazel and the birch.

Mr. Pergande tells us that,—“The study of the life history of these, after numerous failures and disappointments, covering a space of twenty-two years of patient labour” was at length brought to a successful conclusion. I will speak only of the first named insect.

It lays its eggs in October upon the branches and twigs of the witch-hazel. They produce stem-mothers, which in colour are of a dull black, and are set with white, iridescent waxy rods. Around each of these stem-mothers a gall is formed within which it lives. It changes its skin three times before attaining its growth. It then brings forth its progeny (numbering 100 or 120) within the gall. These are the *migrants*. They grow rapidly, changing their skins four times. At the last change they become winged. They leave the gall at the end of May, and seek, and settle upon, the black birch. They are of a dark purplish colour and have colourless or slightly dusky wings.

Each migrant deposits about fifty larvæ upon the under side of the birch leaves. The larvæ change their skins three times, and then present an extraordinary appearance. They are almost round and flat, and have a fringe of cylindrical waxy rods. Their body colour is dusky brown, or black; and, in the fringe, the lowest third of each rod is white, and the other two-thirds glassy and iridescent. The insects at this stage are closely cemented to the leaf. After two generations more, and about the end of August, comes the sixth generation or *return migrants* which undergo four changes—becoming pupæ at the fourth: These pupæ produce the winged insects that return to the witch-hazel. The migration continues throughout September. From these return migrants comes a brood of wingless males and females, the latter of which deposit their eggs upon the witch-hazel twigs in October, as was at first stated.

We have dwelt upon insect life in the different meanings in which the term is used. I trust that your interest in the subject will not end with this night's proceedings. All around us, and all the time, there are natural objects and workings of nature deserving of our close attention. “For everything there is a purpose, and in everything there is a meaning, if only we have the eyes to see it, and the hearts to understand it.” The Entomological Society of Ontario was intended to be, and is, a guide to nature studies. If any gentleman present be not a member of the Society, I invite him to join it. In entomological pursuits he will learn lessons of God's power and goodness that will strengthen his higher life; he will acquire information that will be of interest and service to him all his life long. His presence at our meetings will give new life to our proceedings. He will find new interests and pleasures that will banish *ennui* from the life he leads; and in the end, if he has proved a useful member of the Society, the editor of the day will, I doubt not, write his life-history for the pages of the “*Canadian Entomologist*”!!

PROF. JAMES : Ladies and gentlemen, we always look for a paper of much interest from Dr. Fyles, and he has kept up the good reputation he has already achieved in this Society by his paper this evening. I have always taken a great interest in the Society and never fail to read anything the Doctor has written. I remember some years ago reading some reminiscences of the life of Philip H. Gosse, a celebrated entomologist who lived in that part of Canada from which the Doctor comes. I consider his paper on the insects of the Bible one of the most instructive papers I have ever read ; and others upon the insects of Shakespeare and of our modern poets most interesting and attractive. The Doctor is always able to add a literary finish to his work on entomology. He tells us to-night in one place that natural history is full of surprises, and this reminds me of a little incident I read in a New York paper. Cooper, the novelist, in one of his stories described a young man driving along the road who came to a house, pulled up his horse, jumped down from the rig and tied his horse to a locust. The supposition is, of course, that a locust tree was meant, when, however, the French translator came to this passage he evidently was stuck by the word "locust." He turned to his dictionary and found only one meaning, and that was the locust or grasshopper (*Sauterelle*). and he makes Cooper's young man tie his horse to a grasshopper ! This rather staggered the translator, and he thought it necessary to add a foot-note, which ran as follows : "In America the grasshopper grows to a very large size, so they stuff them and add a few weights to hold them down and place them in front of their houses to use them as tie-posts" ! The natural history of America certainly is full of surprises.

SOME COMMON BUTTERFLIES, AND SOME NOTED BUTTERFLY HUNTERS.

BY WM. LOCHHEAD, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

The younger students of insects, and those of us who are actively engaged in the warfare against injurious insects, can hardly realize the conditions under which the older entomologists worked ; and I make bold to say that we will never know how much we owe to them. We are indeed fortunate in our day and generation. We have ready access to large collections correctly named and arranged through no effort of ours. We have scores of splendidly illustrated volumes, each of which can be bought for a trifle and placed on the shelves of our own library. We have numbers of specialists who can help us out of the many small difficulties which often arise. All of these privileges were denied to the workers of a generation ago, and we marvel at the amount of good work done under obstacles which would now be termed well nigh insurmountable.

It is my purpose this evening to tell you something about some of our great collectors, including some of those stout-hearted men who worked unremittingly without hope of money reward, and more than that, without the sympathetic encouragement of the people whom they were trying to help. They were looked upon as harmless "bug-hunters", and they were allowed to live, because the community believed that it took all kinds of people to make a world. But times have changed. Entomologists are now looked upon as persons who are doing a necessary and a valuable work for the country. Governments spend money on their support, College chairs are endowed that students may receive instruction in Entomology, people are beginning to clamor for a better knowledge of insect-life, and the parents of school children are demanding the introduction of Nature Study into our schools.

I wish to state at the outset that Entomology knows no national boundaries, for the entomologists of all countries form one grand brotherhood of workers. Naturally, then, I shall not confine my remarks to our Canadian band. I shall introduce to you many co-workers from the United States, co-workers whom we always delight to honor, for to them we owe much.

With the aid of the electric lantern, I hope to make quite real both the persons and the insects about which I shall speak. I regret that, through oversight on my part, lantern slides of some of our prominent collectors were not prepared.

The first face shown on the screen is one quite familiar to a London audience. The name of Dr. Bethune is well known in scientific circles throughout Canada, the United States, and Europe. He has been Editor of the "Canadian Entomologist" for upwards of 22 years, and the credit of its present high standing is due almost entirely to his brilliant work. Dr. Bethune was a contributor of valuable papers on insect-life nearly 40 years ago. He is one of the few surviving charter members of the Entomological Society which was organized in 1863. From 1865 to 1873, Dr. Bethune was Editor of the Entomological department of the Hon. Geo. Brown's "Canada Farmer", and for nearly 40 years he has contributed articles to the agricultural papers on subjects of economic importance.

The second face is also familiar to Londoners. Dr. Saunders and Dr. Bethune were a fine team of workers. He, too, is a charter member of the Entomological Society of Ontario, and until he became Director of the Dominion Experimental Farms was one of the leading authorities on Entomological subjects. His work "Insects Injurious to Fruits," published in 1883, is still the best thumbed book on the shelves of the working Economic Entomologist.

The third face is also familiar to Londoners. Mr. J. M. Denton was one of the most earnest collectors of our Society. Readers of the Annual Reports of the Entomological Society recognize how much he helped to make those Reports so valuable.

The fourth face is that of our worthy President,—Rev. Dr. Fyles of Quebec. He and Mr. Lyman of Montreal whose picture follows have done much in stirring up the enthusiasm of lovers of insects in our sister province, and both have done work of real scientific merit.

Our sixth face is that of Mr. Harrington of Ottawa, and is probably not so well known as the preceding, since his duties at Ottawa have prevented his attendance at our annual meetings for four or five years. Mr. Harrington is one of the leading authorities in America on Hymenoptera and Coleoptera. He is one of our younger men, so that much may yet be expected of him.

The seventh face is one well known from the Atlantic to the Pacific. I do not care to say much about Dr. Fletcher in his presence, suffice it to say that his heart and head are as large as his body, and that is saying a great deal. Long may he live to fill the position which he now adorns!

The last Canadian to whom I shall refer is the Abbé Provancher of Laval University, Quebec. In 1869, this indefatigable worker, without the aid of reference libraries or access to reference collections, began the "Naturaliste Canadien" and continued this magazine up to 1891, completing 20 volumes. In the meantime, in 1874, he began his "Faune Entomologique du Canada," a series of volumes devoted to descriptions of Canadian Insects. The first volume, completed in 1877, is devoted to Coleoptera. In 1878-79-80, he issued supplements to this volume. In 1883, he completed a second volume which was devoted to the Orthoptera, Neuroptera and Hymenoptera: and a little later he published additions to his Hymenoptera. In 1890, he completed his third volume devoted to the Hemiptera. He died in 1892. I regret that I am unable to present a likeness of this able French Canadian Naturalist.

Now, I turn to our co-workers in the United States. The first is T. Wm. Harris, who lived from 1795 to 1856. This man was the first paid American Entomologist, and his publications date from 1823. These were followed by a long succession of interesting and original articles dealing chiefly with the injurious Insects of New England. He published a Report entitled "Insects Injurious to Vegetation" in 1841, this being known now as "A Treatise Upon Insects Injurious to Vegetation." As Dr. Howard remarks: "This book is to-day as valuable as when first written, more than 50 years ago." In the early part of his life, Harris

worked practically alone; but, in 1854, Dr. Asa Fitch was appointed Entomologist for the State of New York. Dr. Fitch was born in 1809 and died in 1879. He published 14 reports, in all of which are observations and work of a valuable character.

The next picture is that of Townsend Glover, who might be called the first entomologist of the Federal Government at Washington. His first report dates from 1854. For the 10 years between 1856 to 1866, Fitch and Glover were the only Economic Entomologists of great note in America.

The next face is that of Benj. D. Walsh, an Englishman by birth, who was a contemporary of Fitch and Glover, but began later than the previous two to write articles along economic lines. In 1868, Walsh was appointed State Entomologist for the State of Illinois. He is said to have been a very interesting speaker, and one who could hold an audience of farmers for hours at a time when he dealt with entomological subjects.

The next face is that of C. V. Riley, who also came from England,—one of the most famous economic entomologists the world has ever produced. In 1868, Riley was appointed entomologist for the State of Missouri. He published 9 annual reports covering the whole field of economic entomology. In 1878, on Glover's death, Riley was appointed entomologist of the United States Department of Agriculture. With the exception of two years, when Prof. Comstock was entomologist, Dr. Riley had charge of the Government work up to June 1894, when he was succeeded by the present entomologist, Dr. L. O. Howard.

Dr. Howard is a leader among entomologists; and, as chief of his department, has been a great success. He has the faculty of gathering around him a strong corps of assistants, and these he encourages to do much original investigation by giving them full credit for all the work they do. Dr. Howard is a prolific writer—his latest important publication being "The Insect Book," an illustrated manual of popular entomology.

Our next picture is Dr. J. B. Smith of New Jersey in his office and laboratory. He is another of our best known entomologists. In 1895, he published a college text-book called "Economic Entomology," a valuable guide to the insects which are of economic value. Dr. Smith is a specialist in the Noctuid family of moths.

The next is Dr. W. J. Holland of the Carnegie Museum, Pittsburg. His specialty is the Lepidoptera, and his most recent work is the "Butterfly Book" which should be in every school library. It is a marvel of cheapness and profusely illustrated with coloured plates.

Next comes W. H. Edwards, the great Lepidopterist. His grand work on the butterflies of North America is a monumental one, filling three large quarto volumes with exquisite coloured illustrations.

The next picture is that of Prof. Comstock of Cornell University. Although an investigator of great originality, his strongest claim on the brotherhood of entomologists is the inspiring influence which he has exerted on the many students who flock to his class-room and laboratory. I may say truly that about two-thirds of all the entomologists in America to-day have been in his laboratory and have come under his influence. His published works are known to every student. They have done much to systematize the study of insects, and to make it possible for the young collector to make headway.

Next comes one of our famous women who have popularized the study of insects. Mrs. Comstock is a meet companion and helpmate for the Professor. Besides being a student of insects, she is an illustrator of insect life and has prepared a large proportion of the illustrations in her husband's books. For the past two years, she has been devoting her attention to the extension of Nature Study in New York State.

The next woman is the late Miss Ormerod of England. She has done more than any other person in Great Britain to build up economic entomology. Her reports published at her own expense, are almost invaluable, and her Manuals are classics.

The last picture is that of Prof. Webster, whom most of our members know well. For

many years, he attended our annual gathering, and assisted us in our discussions ; he moreover helped us when we were fighting the San José scale. Having received an appointment in Illinois, he is now unable to be with us, much to our mutual regret.

Now we come to the consideration of some of our common butterflies and moths. (Colored illustrations of the following were presented by means of the lantern) ; *Papilio turnus* ; *Vanessa antiopa* ; *Pieris rapae* ; *Anosia archippus* ; *Eudamus tityrus* ; *Samia cecropia* ; *Hyperchiria io* ; *Phlegethontius celeus* ; *Everyx myron* ; *Deilephila lineata* ; *Tropæa luna* ; *Oedemasia concinna* ; *Orgyia leucostigma* ; *Bombyx mori* ; Cutworms ; Clothes' Moths ; Hyphantria cunea ; *Acronycta* ; *Prionoxystus robiniae* ; *Halisidota* ; and *Sannina exitiosa*.

In most cases, all the four stages egg, caterpillar, pupa, and imago were shown. Such forms as *Pieris*, *Orgyia*, *Bombyx*, Cutworms, Clothes' Moths *Hyphantria* and *Sannina*, which are of economic importance, were dwelt upon more at length.

At the conclusion of Prof. Lochhead's lecture, Dr. Fletcher rose and said : I am sure everyone present has been much pleased with the entertainment we have had this evening ; Dr. Fyles's delightful address, full as it was of so many ideas of interest, must have pleased everybody. Prof. Lochhead's illustrations with his remarks will, I have no doubt, teach us a great deal about insects, and I have much pleasure in moving a vote of thanks to Dr. Fyles and to Prof. Lochhead.

The motion was duly seconded and carried unanimously.

Dr. BETHUNE : Before we separate I should very much like to propose a vote of thanks to the chairman for the very able manner in which he has presided here to-night, and for coming from Toronto to be with us, also for his interesting remarks at the beginning and at other times during the proceedings ; and I should like to add to this vote of thanks the name of Mr. Principal Merchant, who has kindly allowed us the use of this lecture room, and of Mr. Dearness for the able way in which he has taken charge of the lantern.

The motion was seconded and unanimously adopted.

Mr. Dearness made a suitable reply on behalf of himself and Mr. Merchant, and the meeting adjourned.

SECOND DAY'S SESSION.

THURSDAY, OCTOBER 30th, 1902.

The Entomological Society resumed its meetings at 11 o'clock, a. m., the President, Rev. Dr. Fyles, occupying the chair. The Directors' Reports on the insects of the year were first called for ; at the close of the reading of each there followed a general discussion on the insects referred to and much valuable information was given. Specimens were also exhibited in illustration of the subjects treated of, many of which were presented to the Society's collections. The reports of the Council and officers for the past year were read and adopted ; the meeting then proceeded to the election of Officers, which resulted as shown on page 2. The reports of the Branches and Sections were read and approved.

In the afternoon the Society met at 2.30 o'clock and the chair was taken by Prof. Lochhead, the newly elected President. After the reading of Reports was completed, papers were read by Dr. Fletcher, Prof. Lochhead, Messrs. Moffat, Lyman, Stevenson, Norris, Gibson and others, and were in many cases fully discussed. The majority of the papers are published in the following pages, but a few, being of a technical character, are to appear in the "Canadian Entomologist," the monthly organ of the Society ; among the latter should be mentioned papers by Dr. Fletcher and his assistant Mr. Arthur Gibson on "The Life-history of the Variable Cutworm, *Manestra Atlantica*"; by Mr. Gibson on the Canadian species of the genus *Apantesis* (*Arctia*) with special reference to the larvæ ;" and "the Life-history of *Crocigrapta Normani*."

A large number of rare and interesting specimens were exhibited by Dr. Fletcher, Dr. Fyles, Mr. A. Gibson, Mr. C. H. Young, Mr. H. H. Lyman, Prof. Lochhead, Mr. J. D. Evans, Mr. G. Chagnon and Mr. A. E. Norris.

The following exhibits were made by Dr. Fletcher and Mr. Arthur Gibson :

A beautiful series of *Smerinthus ophthalmicus* reared from eggs received from Mr. J. W. Cockle, of Kaslo, B. C. Most of the specimens were of a beautiful fawn color, although the female which laid the eggs was of a slaty grey tint.

A series of *Nemeophila petrosa* from eggs collected at Banff by Dr. Fletcher, and to compare with these a series of the form known as *Nemeophila Selwynii*, Hy. Edwards, from Nepigon. Dr. Fletcher stated that although the Rocky Mountain form was extremely variable, one specimen being actually almost undistinguishable from *N. Selwynii*, the species taken at Nepigon was extremely constant in markings. Of hundreds taken during the last ten years he had never been able to catch, or rear, one which approached the western form in the amount of markings. The only difference noticeable between extreme examples of these two forms, which seems constant, is the presence, at the base of the costa of the western form, of an orange mark of varying length.

Life histories of the following species, showing larvæ in all stages, pupæ and moths :

Crocigrapha Normani, *Mamestra grandis*, *Mamestra atlantica*.

Two new strawberry pests from Vancouver Island, *Petrophora truncata* and *Scopelosoma tristigmata* were also shown in their different stages.

Hemileuca maia, var. *lucina*, from Mr. Criddle, Aweme, Man.

Coenonympha inornata taken at Ottawa this year for the first time by Mr. A. E. Richard.

Erebia disa from Banff, Alta.

A series of *Erebia epipsodea* showing great variation in the undersides.

Lycena pseudargiolus, var. *nigrescens*, a new variety from Mr. Cockle, of Kaslo, B. C.

Lycena pseudargiolus, var. *argentata*, a new variety from Manitoba (E. F. Heath).

Plusia formosa, from Mr. W. McIntosh, St. John, N. B.

Semiophora elimata, from Mr. W. McIntosh, St. John, N. B.

Phyciodes Hanhami, a new species from Manitoba somewhat resembling *P. nycteis* on the underside.

The brown-tail Moth, (*Euproctis chrysorrhoea*) a perfect male, the first specimen recorded from Canada, which was taken by Mr. W. McIntosh, at St. John, N. B.

Chrysophanus dorcas, male and female, a species taken on the Georgian Bay, at Nepigon and at Rounthwaite, Man. which Dr. Fletcher believes to be the true *C. dorcas*, of Kirby.

A fine specimen of *Euprepia caje*, var. *Utahensis*, bred from larva received from Mr. E. P. Venables, Vernon, B. C.

Mr. Gibson in illustration of his paper on Canadian species of the genus *Apantesis* (Arctia) exhibited a fine series of *phalerata* and *nais*, with larvæ in different stages, as well also of specimens of *vittata*, *Anna*, *Williamsii*, with the var. *determinata*, *ornata*, with the var. *achaea*, *phyllira*, *rectilinea*, *Celix*, *figurata*, *michabo*, *Nevadensis* and *complicata*. Besides these he showed three specimens of a species which Dr. Dyar thinks may possibly be *Quensellii*, var. *turbans*, described from Mongolia, and which is new to North America. These were collected at Calgary, N. W. T. by Mr. T. N. Willing, and in a general way somewhat resemble small specimens of *virguncula*.

Rev. Dr. Bethune exhibited the type specimen from which Dr. Saunders described *A. Celix* which is now believed to be a good species.

Votes of thanks were passed to the following :

Mr. C. H. Young, Ottawa, for a donation of specimens for the Cabinets, including inflated larvæ of 6 species of noctuid larvæ.

Mr. A. E. Norris, Montreal, for sending for exhibition a collection of lantern slides taken by Mr. A. H. Holden and beautifully coloured by Mr. Norris, and also for sending for exhibition a collection of insects to illustrate his paper on the Insects of the year at Montreal.

Mr. G. Chagnon, Montreal, for a pair of the new species of Dipteron, *Tephronota Canadensis* lately described.

Dr. Fletcher, for a pair of *Chionobas Macounii* for the Society's Cabinet.

Mr. H. H. Lyman, Montreal, for a specimen of *Argynnis Chariclea*.

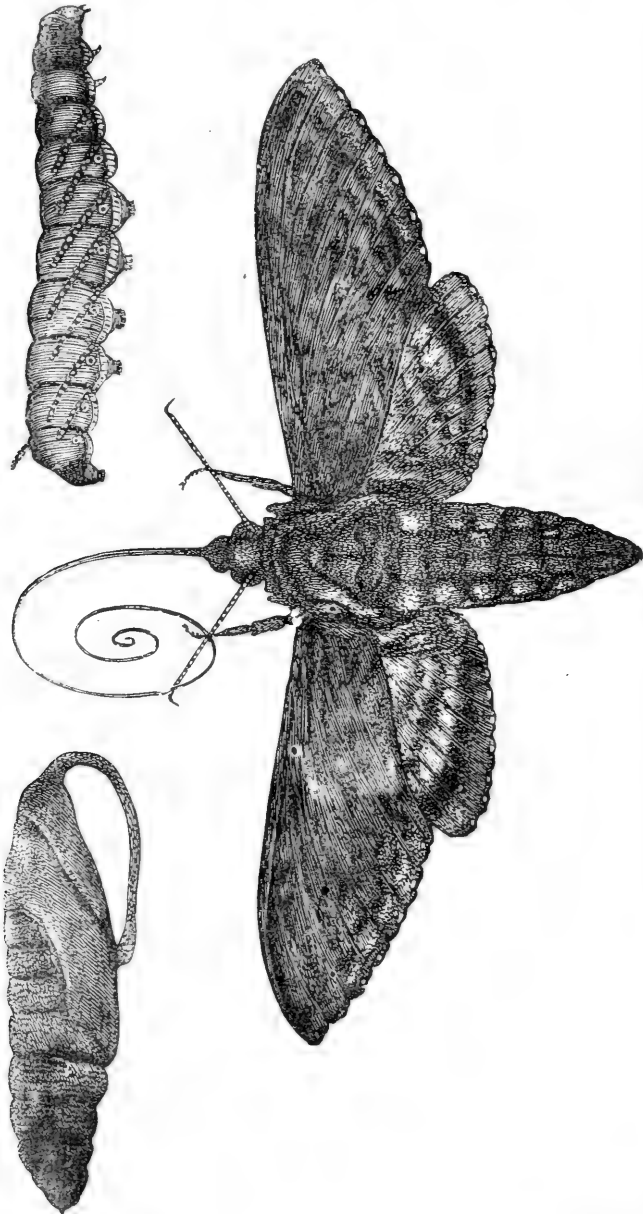


Fig. 19. *Protoparce celeus*: Caterpillar, Chrysalis and Moth.

REPORTS ON INSECTS OF THE YEAR.

DIVISION No. 1.—OTTAWA DISTRICT. C. H. YOUNG, HURDMAN'S BRIDGE.

The season of 1902 in the Ottawa district has been a very poor one for the collector. The writer, outside of some success he had at Meech's Lake, Que., during a six week's stay, took very few acceptable things.

The very cold and wet season, especially in May and June, doubtless was the cause of such a poor year. In August, which month I spent at Meech's Lake, however, I was fortunate enough to capture a good number of interesting species, some mention of which I will make afterwards.

The most noticeable injurious insect of the season around Ottawa was doubtless the Birch Skeletonizer (*Bucculatrix Canadensisella*) which was so abundant last year, and which, the present season, seemed to do just as much damage to birches of all kinds. It was this year accompanied, however, by numbers of a large, grayish green aphid, and the damage was specially noticeable towards the end of August.

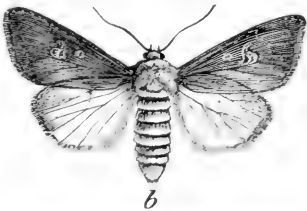
Garden crops were attacked to some extent in this district. The Onion Maggot was very troublesome in some places and caused considerable loss.

Asparagus plants in my garden were rather seriously attacked by the larvæ of *Peridroma occulta*, one of the large noctuid moths. This caterpillar when mature is a large cutworm, and is very voracious, feeding at night, and hiding in the earth at the foot of the plant during the day. Towards the end of September a neighbour of mine brought me some specimens of the Tomato worm (*Protoparce celeus*), Fig. 19, saying that they were doing damage to the foliage of his tomato plants. I immediately went over to his place and in two rows, one about a hundred feet long, the other about fifty, I collected 59 specimens of this caterpillar. On the 1st July I noticed three insects resting on the stem, of a leaf of vegetable marrow, and on collecting them was surprised to see that they were genuine specimens of the Squash Bug, Fig.

20. Dr. Fletcher in his report for 1901, says, "This bug is very rare indeed at Ottawa: Twenty years ago, two specimens were taken here by Mr. W. H. Harrington and none were seen since, although looked for carefully, until the past season, when a few specimens were taken." Dr. Fletcher recommends:



(1.) "Hand-picking, early in the season, of the old bugs when they first resort to the plants, and also of the easily seen egg clusters. This requires an inspection of the vines every day or two. The young bugs may be easily destroyed with a spray of kerosene emulsion, or of whale-oil soap.



(2.) Trapping,—This consists of placing at intervals through the plantation, shingles or pieces of board, beneath which the bugs gather for shelter. By examining these every morning, many may be captured. In a season when the bugs have been abundant, all vines should be burnt as soon as the crop has been gathered. In this way, many of the insects in all stages of development will be destroyed."

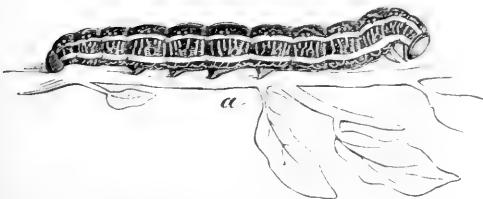


Fig. 21. *Mamestra picta*: a, Zebra caterpillar; b, Moth.

The Caterpillars of the White Cabbage butterfly were not so numerous as last year but caused, however, some harm in turnip and rape fields, as did also the Zebra caterpillar (*Mamestra picta*) Fig. 21, which was

fairly abundant. Early in the year hundreds of cut-worms of *Noctua fennica* were present in clover fields but I have not heard of their having done serious damage.

During the season considerable attention has been given to studying life histories, particularly of lepidoptera. Many specimens have been reared and some additions made to our knowledge of common species.—Some of the results of this work are submitted herewith showing the larvæ, pupæ, and perfect insects and in some cases parasites also of:—

<i>Hydræcia cataphracta</i>	In burdock. (<i>Lappa major</i> .)
<i>Gluphisia trilineata</i>	On Aspen. (<i>Populus tremuloides</i> .)
<i>Edema albifrons</i>	On Oak.
<i>Lycomorpha pholus</i>	On lichen on rocks.
<i>Eudryas grata</i>	On grape vines.
<i>Metzeria lappella</i>	Seeds of Burdock.
<i>Euplexia lucipara</i>	Ferns of all kinds.
<i>Peridroma occulta</i>	Injuring asparagus.
<i>Mamestra legitima</i>	On asparagus and clover.
<i>Papilio asterias</i>	On parsnip, celery and carrot.
<i>Sphinx eremitus</i>	On Mentha and Monarda.
<i>Notodonta stragula</i>	On hazel nut.
<i>Leucania albilinea</i>	On grass and clover.
<i>Pyrameis hutterera</i>	On Pearly Everlasting.
<i>Calocampa curvamacula</i> ...	On Apple.
<i>Arctia virgo</i>	On Plantain, dandelion, etc.
<i>Synchlora rubrifrontaria</i>	On <i>Quercus macrocarpa</i> .
<i>Fenisea tarquinius</i>	On <i>Schizoneura tessellata</i> .
<i>Ichthyura albosigma</i>	On Aspen. (<i>P. tremuloides</i> .)

The following species have also been reared.

<i>Basilarchia disippus</i>	from egg.....	On Willow.
<i>Grapta progne</i>	"	On Wild Gooseberry.
<i>Xylina Bethunei</i>	"	On Apple.
<i>Xylina disposita</i>	"	On Apple.
<i>Xylina Grotei</i>	"	On Maple.
<i>Ypsolophus pometellus</i>	"	On Apple.
<i>Hyperchiria Io</i>	"	On Aspen and basswood.
<i>Mamestra picta</i>	"	On Turnip
<i>Noctua fennica</i> ..	"	On Clover.
<i>Noctua collaris</i> ..	"	On Clover, grasses, etc.

I noticed in examining the collections of the Society last year that some of the specimens are faded or imperfect. I have therefore much pleasure in presenting the following which I trust may be found acceptable:

Larvæ of *Mamestra picta*, *Calocampa curvamacula*, *Noctua fennica*, *Xylina Bethunei*, *Xylina disposita*, *Orgyia leucostigma*, *Datana ministra*; Moths of *Eudryas unio*, *Lycomorpha pholus* (2), *Epirranthis obfirmaria* (2), *Mamestra lorea* (2), *Abrostola urentis*, *Alaria florida*, *Hadena verbascoides*, *Xylina pexata* (2), *Cirroedia pampina*; larvæ of *Papilio asterias*.

DIVISION No. 2.—BAY OF QUINTE. BY J. D. EVANS, TRENTON.

No cases of serious injury from noxious insects came under the writer's notice, although late in the season *Colias philodice* (Fig. 22) and *Pieris rape* (Fig. 23) were quite numerous, flitting about the clover fields containing the ripened second crop.

Much damage has been caused, however, to some orchard and farm crops from the unusual character of the season throughout this section; it having been generally speaking extremely wet and remarkably cool. The principal crops thus severely injured are the apple, clover, potato, corn and tomato. The first mentioned (apple) is very abundant, but the fruit is being destroyed by a fungus growth, which may not appear to be of much consequence when the apples are being packed but develops enormously in a short time and renders the fruit unfit for sale. A sample is herewith submitted of a test case, where a fruit packer put up a barrel of choice apples which had insignificant looking spots when packed; they were packed in the usual careful manner, placed on board of a steamboat and left under

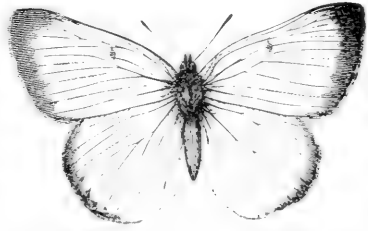


Fig. 22. *Colias philodice*. Colours: yellow and black.

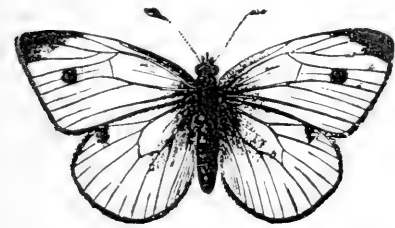


Fig. 23. *Pieris rapae*. Colours: white and black.

the usual conditions of transshipment on board for three weeks, at the expiration of that time they were opened up and found to be covered with the large scabs which appear on the samples exhibited. [The sample apples shown were so damaged as to be perfectly worthless.]

The potato crop is almost an entire failure owing to a blight which struck the vines when in bloom and developed into rot in the tubers.

A large proportion of the red clover hay was partially, and in cases wholly, spoiled in the curing owing to the continuous rains prevalent at that time. From a like cause coupled with the low temperature, corn and tomatoes, which are grown in large quantities for canning purposes were, generally speaking, a failure.

DIVISION NO. 3.—TORONTO BY E. M. WALKER.

During the present year but few observations were made by the writer on the ravages of injurious insects, owing to a necessary absence from the city during a large part of the season,

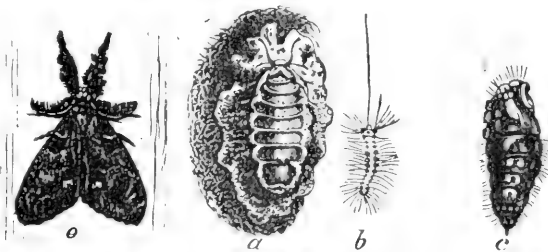


Fig. 24. Tussock Moth: *e* male moth; *a* female moth on cocoon; *b* young larva; *c* chrysalis.

and being fully occupied with other matters during the remainder. A few of the most prominent pests were noted, however, though doubtless many species of equal importance escaped observation.

Tent caterpillars (*Clisiocampa Americana*) were not specially bad this year. A few were seen on the wild black cherry early in the season but fruit trees on the whole have been comparatively free from them.

Another enemy of the apple, the Codling moth (*Carpocapsa pomonella*) committed considerable injury this season, and in one orchard, for example, on Davenport Road, evidences of its presence could be detected in about seventy-five per cent. of the apples.

The Tussock moth (*Orgyia leucostigma*) Figs. 24 and 25, is still by far the most formidable enemy of our shade trees, although it appears to be gradually diminishing in numbers and was distinctly less abundant than it has been during the past three or four years. Very few trees were observed that were completely stripped or nearly so, though in the lower part of the city there were a good many badly disfigured trees. Very little has yet been done to control its ravages.

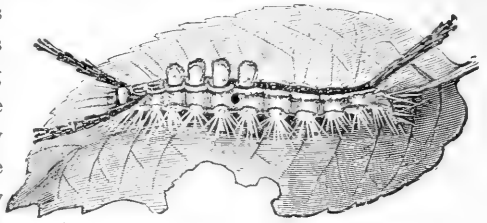


Fig. 25. Tussock Moth Caterpillar, full-grown.

On the above property there was a large plantation of red currant bushes, which, at the time they were seen by the writer (August 15) were almost completely stripped by the larvæ

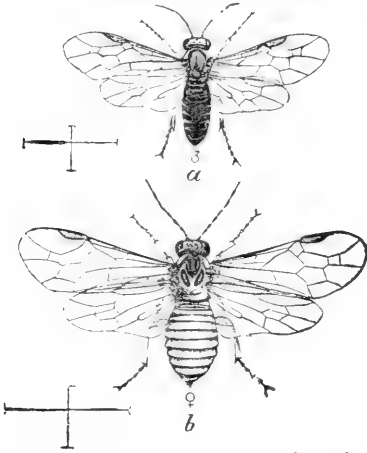


Fig. 26. Currant Saw-fly : a male ; b female.

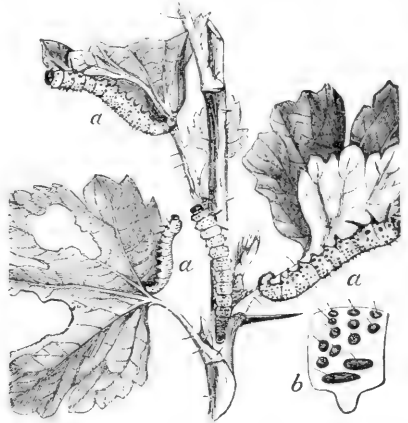


Fig. 27. Currant Saw-fly caterpillars.

of the imported currant Saw-fly (*Nematus ventricosus*) Figs. 26, 27 and 28. They occurred in altitudes and in various stages of development, and although the currant bushes were nearly bare of foliage, an adjacent patch of gooseberries was almost entirely free from the pest. Notwithstanding the condition of the foliage the fruit was abundant and of large size.

About the middle of May a large number of Pin cherry trees (*Prunus Pennsylvanica*) in High Park were found to be badly attacked by the Cherry Aphis (*Myzus cerasi*) the leaves at the ends of the branches being very much crumpled and disfigured. Subsequently they were found plentifully on the wild black cherry and also on the cultivated cherry.



Fig. 28. Currant Saw-fly : leaf showing eggs and holes eaten by the young larvae.

The Cabbage Butterfly (*Pieris rapae*) has been exceedingly abundant this summer and has caused a great deal of damage to cabbages and allied vegetables in this locality. On August 15, while inspecting a large market garden north of the city, the writer observed great numbers of the larvæ in all stages on a large bed of cabbages. They were to be found practically on every head, and many plants were quite unmarketable. An adjacent bed of cauliflowers was but little affected, though a few caterpillars were found on some of the heads. In another bed of cabbages only a few hundred yards distant from the one just referred to, the caterpillars were much fewer in numbers though plentiful enough.

The only other serious pest noticed attacking garden vegetables was the Potato Beetle (*Doryphora 10-lineata*, Say), which occurred in distressingly large numbers on potatoes, though tomatoes as far as the writer observed were pretty free from them.

An insect injurious to shrubs and shade-trees which seems to be on the increase lately is *Ormenis pruinosa*, a large stoutly-built leafhopper resembling a small bluish grey moth. I first noticed them in large numbers in 1901 on some shrubs which were planted in the spring of the same year. This year they were everywhere and showed themselves to be possessed of by no means a restricted appetite. While most abundant on the Virginia creeper and grape-vine they were common on many other shrubs and trees, etc., such as the elm, maple, bass-wood, gooseberry, almond, Tartarian honeysuckle and rhubarb. The larvæ are whitish creatures not much like the adults in appearance, and have the habit of arranging themselves in irregular rows along the smaller branches and twigs, the whole aggregation being partly enveloped in a white flocculent material. The full-grown insects were first observed towards the end of July and remained until the beginning of October. Late in September they could be seen resting on the trunks of almost every shade tree except horse chestnuts, upon which they were very scarce and were probably accidental.

Among the insects which were abundant last year but have not been troublesome this season the Birch Bucculatrix (*Bucculatrix Cinnadensisella*) is noteworthy. The trees have been quite healthy the whole of this year, though in May I noticed that some of them were rather badly infested with a large species of aphid. Butterflies on the whole have been scarce according to the statements of local collectors, and two of our most destructive grasshoppers *Melanoplus atlantis* and *Camnula pellucida* were not nearly so numerous as usual, probably owing to the wet season, since both species thrive best in hot dry weather.

DIVISION NO. 5—LONDON DISTRICT. BY J. A. BALKWILL.

I am very happy to report that we have not had any insect visitations of a serious nature in this district during the past season.

Last winter my attention was called to some larvæ which were doing considerable injury to hay in barns in a part of London Township. They were so plentiful that I collected over 30 of them from a small handful of hay, and Mr. Moffat kindly identified them as the Dry Clover Moth (*Asopia costalis*), Fig. 29. By spinning their webs over the stems of the hay, they made it so unpleasant that horses and cattle did not care to eat it, and it thus caused a serious loss to those in whose barns it was found.

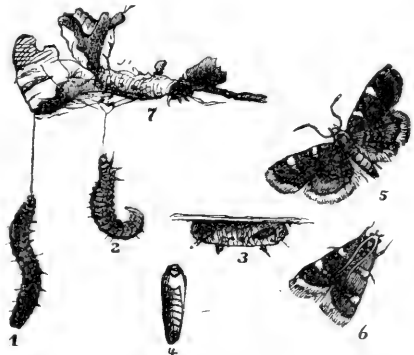


Fig. 29. Clover Moths, Caterpillars and Chrysalis.

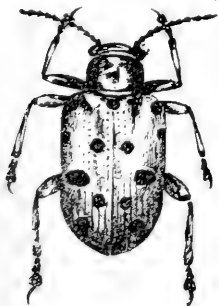


Fig. 30. 12-Spotted Asparagus Beetle (greatly magnified).

In August, during our Horticultural Society's Flower Show, Mr. Butler, St. George Street, London, asked me if I knew a beetle that attacked the asparagus; from his description I suspected that it was new, and therefore asked him to bring me some of them, which he did the next day. On shewing them to Dr. Bethune, who is always willing to oblige, he identified them as the Asparagus beetle *Crioceris 12-punctata* (Fig. 30). This, I think, is the first record of this insect for the London district.

The Codling Moth has not been as much in evidence this season as formerly, no doubt caused by the cold, wet weather, and this, I think, is the reason that insects in general have not been so plentiful as usual, mosquitoes excepted.

The *Datana*, which did so much injury to Black Walnut and Hickory trees last year, appeared again this season, but in very much smaller numbers, and the damage was very light.

The Buffalo Carpet Beetle (Fig. 31) has become a serious pest in this district, and causes great loss in carpets and other woollen articles. To give an idea of how plentiful they are, I may mention that on one bush of *Spiraea* in 5 days I collected over 100 beetles.

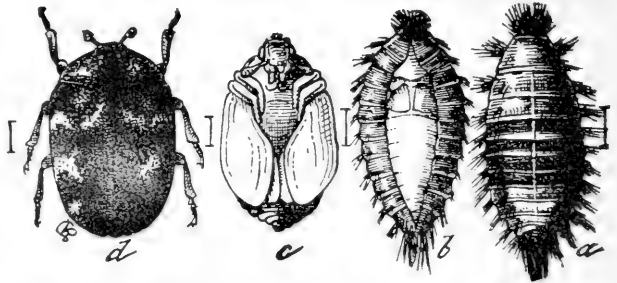


Fig. 31. Buffalo Beetle. a, larva (destructive stage); b, pupa within larval skin; c, pupa; d, beetle—all much magnified.

In the discussion which followed the reading of the Directors' reports, Prof. Lochhead remarked upon the progress of the *Asparagus* beetles. *Crioceris 12-punctata* (Fig. 30) had taken the lead of the other species, *C. asparagi* (Fig. 32), in their westward movement, while

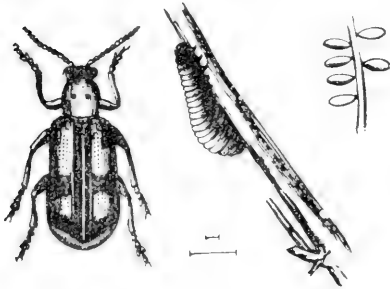


Fig. 32. Asparagus Beetle, larva and eggs.

in the neighboring States the opposite was the case. Last year they had reached Guelph, the former species being much the more abundant, and now it alone had arrived at London. Dr. Fletcher stated that in the Niagara District both species were equally abundant, and he thought it remarkable that the 12-spotted beetle should have moved faster than the other. The asparagus rust he found very injurious last year at Ottawa, but this year there was very little of it. Mr. Balkwill had observed the same thing in gardens in London, where much injury had been caused by rust

last year it was not noticeable this summer: he also stated that the Codling Moth was very little in evidence in this neighborhood. Mr. Fisher asked how it was that the Codling Moth was so rare in the District referred to. Mr. Balkwill said that he could not account for it, as the owners of orchards had done no spraying. Mr. Fisher thought that the diminution in the numbers of the insect must have been caused by the small crop of fruit last year, which deprived it of a sufficient supply of food, and therefore prevented a large number of the worms from attaining their maturity. He then asked what steps should be taken to control the *Asparagus* beetles. In reply it was stated that good results had followed from dusting the plants regularly with fresh lime when the larvæ were upon them.

Dr. Fletcher, in reference to the Codling Worm (Fig. 33) urged very strongly the importance of spraying during such a year as this, when their numbers were fewer than usual. We now had the enemy at its weakest, and could without much difficulty reduce its numbers to such an extent that it would take some time to become abundant again. Furthermore, good fruit brings a high price; it pays well, therefore, to persevere in spraying. He considered that the reduction in the numbers of the insect was due to the cold, wet season, the small food supply and the extended use of spraying throughout the country. Among the enemies to this fruit, he mentioned the Apple-Weevil (*Anthonomus quadrigibbus*), Fig. 34, which he had found also in wild haws, and the Plum Curculio, which often attacks apples.

Mr. Fisher spoke of the best means of controlling the Codling moth; he considered the bandage system the most effective of all, but the bandages must be removed at least every ten days and the bark beneath them scraped. If this is not done, the bandage proves the most

convenient and safest place for the worm to change into a chrysalis, and thus far more harm than good is done. He strongly recommended three things—first, spray with Paris green during the first week after the blossoms have fallen, later than that is of no use ; second, bandage the trees and remove regularly ; third, keep hogs in the orchard to eat up the fallen fruit and thus destroy the worms contained in it.

Dr. Fletcher said that spraying, properly done, saved seventy-five per cent. of the fruit. East of Toronto there was only one brood of the Codling moth in the year and therefore bandaging the trees was of no use, but west of Toronto there were two broods per annum, the second being much the worst, and there bandaging produced excellent results. The bandages should be passed through a clothes-wringer which could be carried in a wheelbarrow from tree to tree, or they might be dipped into scalding water. The worms, however, will not all be found in the bandages, for about half of them burrow into the bark ; these can be got rid of by scraping with a wire brush which effectually tears them out of their burrows. He considered

burlap or sacking the best material for the bandage and straw the very worst, because it is so hard to put on and makes such a litter in the orchard. One or two thicknesses of burlap, five or six inches in width, tied in the middle with a string, makes a satisfactory bandage. Hogs were very useful in the orchard to devour the fallen fruit. The moth

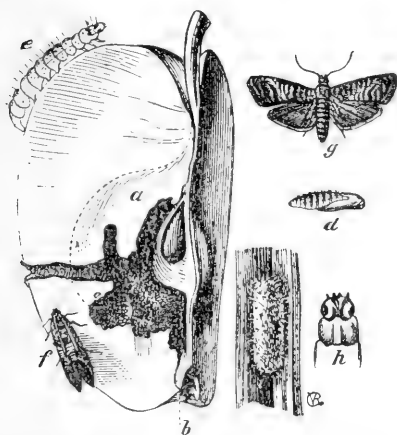


Fig. 33. Quarter of an Apple shewing the work of the Codling Worm ; the insect in all stages.

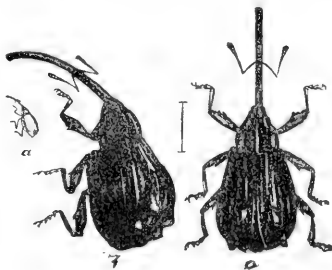


Fig. 34. Apple-Weevil (greatly magnified).

did not lay her eggs till the fruit was about the size of a pea and continued laying till it was as large as a hickory nut ; during this period spraying should be done.

Mr. Fisher said that the calyx (at the tip of the young fruit) closes about a week after the blossom falls, and therefore it is necessary to spray early.

Prof. Lochhead found the Haseltine trap-lanterns perfectly worthless as regards the destruction of the Codling moth. They caught as many beneficial as injurious insects, but no Codling moths. "The Expansive Tree-protector" is all right in principle, as it is a bandage, but he found in nearly every instance that it was doing harm to the tree. The poisonous substance with which the felting is soaked was not effective ; the Codling larvæ were lively and active in it, also spiders and other insects which took advantage of the shelter. He had also found larvæ crawling over the sticky substance which was supposed to be a complete barrier against them. The worst feature about it is that it is said to expand automatically with the growth of the tree ; he found that it failed to do so, but gradually cut right into the wood through the bark and in time girdled the tree ; this could only be prevented by frequently opening and moving it. Sacking or burlap was ever so much better, as well as cheaper and simpler. He was surprised to find how remarkably active the agents have been in selling these "protectors" ; they were to be seen in orchards all over the country.

Mr. Evans said that in his trap-lantern (described in the last Annual Report) he had caught a great variety of insects, but no Codling moths. They are evidently not attracted by light

Mr. Walter Smith related his experience with bandages, and said that the main cause of failure in their use is that people will not take the trouble to remove them regularly and then they become excellent hiding places for the worms.

Mr. Fisher found it a good plan to drive two nails into the tree and leave them there; the string of the bandages could be twisted around them and released when the bandages were taken off in much less time than was required for tying and untying.

Mr. Balkwill spoke of the scarcity of clover seed this year, and wished to know whether this could be attributed to the destruction of the crop by the clover-seed weevil (*Phytonomus punctatus*); his own opinion was that the scanty supply of seed was due to the character of the season. The weather had been continuously cold and wet, so that the blossoms did not open and consequently the flowers were not fertilized.

Dr. Fletcher said that he had found the weevil abundant in British Columbia this year. Dr. Bethune stated that last year it was very numerous in London but this year he had not seen a single specimen.

REPORT OF THE COUNCIL.

The Council of the Entomological Society of Ontario begs to present its report for the year 1901-2.

The thirty-eighth annual meeting of the Society was held in London in November, 1901, and was well attended by members from a distance as well as those resident in the city. It was also favoured with the presence of the Hon. J. Dryden, Minister of Agriculture for Ontario, and Mr. G. C. Creelman, Superintendent of the Farmers' Institutes of Ontario. During the first afternoon a conference was held to discuss the progress, present aspect and future outlook of the San José scale in Ontario. In the evening a public meeting was held in the Normal School: the chair was taken by the Hon. J. Dryden, who delivered the opening address. The Rev. Dr. Fyles then read his presidential address on "The Importance of Entomological Studies to the Community at Large," and illustrated his remarks with beautiful coloured diagrams, the work of his own hand. Dr. Fletcher followed with an address on "The Value of Nature Study in Education," and concluded with an exhibition of lantern slides of plants, insects and other natural objects of interest. The following day was occupied with the reading of papers and the reports of the officers, branches and sections of the Society.

The thirty-second Annual Report on economic and general Entomology was presented to the Minister of Agriculture for Ontario in February last and was printed and distributed in the beginning of May. It contained 128 pages and was illustrated with three maps and fifty-eight figures in the text, a photogravure portrait of the late Miss Eleanor A. Ormerod and a very beautiful full-page plate of thirty-three varying specimens of *Hyphantria cunea* kindly contributed by Mr. Henry H. Lyman in illustration of his paper on "The North American Fall Web-worms." Besides the account of the conference on the San José scale and the proceedings at the annual meeting, the Report contained papers on the injurious insects of the year by Messrs. Young, Evans, Johnston, Lochhead and Moffat; "The Painted Lady Butterfly" and the "Entomological Record for 1901," a new feature which is to be continued annually, by Dr. Fletcher; "The trend of Insect diffusion in North America," the "Imported Willow and Poplar Curculio," and "The Common Cheese-mite living in *Sporotrichum globuliferum*," by Prof. F. M. Webster; papers by Prof. Lochhead on the "Hibernation of Insects" and "Nature study Lessons on Mosquitoes"; by Mr. Moffat on "Anosia Archippus does not Hibernate"; by Mr. Evans, on "Collecting at Light"; Mr. Winn, on captures made at "The Milk-weed at Dusk"; Mr. Walker, on "A Collecting Trip in South-Western Ontario"; Mr. Gibson, on "A Day at the Mer Bleue." Dr. Fyles contributed a paper on "Crickets,"

and Mr. J. B. Williams, on "The Food of the Grass Snake." The volume closed with a report from the North-West (Canada) Entomological Society and obituary notices of the late Miss Ormerod and Mr. Otto Luggar.

The *Canadian Entomologist* has been regularly issued at the beginning of each month. The 33rd volume was completed in December last; it consisted of 348 pages, illustrated with five full-page plates and eleven figures from original drawings. The contributors number sixty-two and represent Canada, the United States, England, Germany, Luxembourg and India. Of the 34th volume ten numbers have thus far been published; those for November and December will be duly issued at the beginning of their respective months.

During the greater part of the year meetings for the study of Entomology have been held on Tuesday evenings, followed during the summer months when the weather was favourable by collecting excursions on Saturday afternoons. The Geological Section has met regularly on Thursday evenings; the Ornithological once a month on Fridays; the Microscopical on alternate Saturdays during the winter and the Botanical during the summer and autumn. The reports of these Sections, giving a record of their proceedings, will be read at this meeting and be published in the next Annual Report of the Society.

The good work of the Society has been much extended by the delivery of popular lectures by several of the members. Dr. James Fletcher has given a large number on insects, noxious weeds and nature study in various places in Ontario, Quebec, the Maritime Provinces, Manitoba, the North-West Territories and British Columbia, in fact from one end of the Dominion to the other. Dr. Bethune has lectured, chiefly to school children and horticultural societies, in London and a number of towns not far distant, on noxious, interesting and beneficial insects. Mr. W. E. Saunders has addressed teachers and other assemblies in Montreal, Ottawa, London and elsewhere, on "The Birds of Canada." The Rev. Dr. Fyles has given popular lectures on Entomology in Quebec and Levis, P. Que.; and Prof. Lochhead has delivered lectures on entomological subjects in Guelph, Port Elgin, Owen Sound, Beeton, Woodstock and Hamilton.

All of which is respectfully submitted.

THOMAS W. FYLES, President.

REPORT OF THE MONTREAL BRANCH.

The 241st regular and 29th annual meeting of the Montreal Branch of the Entomological Society of Ontario was held in the library of the Natural History Society, University street, on Tuesday evening, May 13th, 1902.

Owing to the absence of the President, due to illness, Mr. Charles Stevenson, Vice-President, occupied the chair.

The minutes of the last meeting were read, and minutes of last annual meeting taken a read and confirmed.

The Vice-President on behalf of the Council read the following report :

REPORT OF THE COUNCIL.

The Council takes pleasure in presenting the following report of the Society's work during the seasons 1901 to 1902 :

Nine regular meetings have been held, the average attendance being seven.

Several field days were held, the principal ones being as follows :—

Point aux Trembles.....	1st June.
St. Martin Junction	15th “
Outremont.....	22nd “
St. Hilaire.....	1st July.

The following papers were read :

The Dissemination of Disease by Dipterous Insects . . . Charles Stevenson.

Curious Effects of the Attack of an Asilus Fly on *Colias*

Philodice A. F. Winn.

Is *Telea polyphemus* double brooded somewhere? . . . Charles Stevenson.

On the Family of Flies called the Syrphidae..... G. Chagnon.

Eggs of *Tolyte relleida* A. F. Winn.

On collecting and preserving micro-lepidoptera H. H. Lyman.

The Milkweed at dusk..... A. F. Winn.

A new *Gortyna* and notes on the Genus H. H. Lyman.

Coloration of Insects Graeme M. Stewart, Toronto.

The Asilidae or Robber Flies G. Chagnon.

The North American Fall Web-worms..... H. H. Lyman.

An Assam Danais and its mimics..... Charles Stevenson.

An Hermaphrodite *Lycæna* A. F. Winn.

An Introduction to the order Hemiptera..... G. A. Moore.

Notes on *Eurosta solidaginis* Fitch G. Chagnon.

Notes on *Lycæna Scudderii* H. H. Lyman.

Lepidopterous Irisation..... Charles Stevenson.

Remarks chiefly on *Hydræcias*..... A. F. Winn.

Our staff of members remains practically the same as last year.

Mr. A. E. Norris has kindly offered us room in his place of business to locate there our cabinet and collection. We must all offer to this gentlemen our sincere thanks for the kind assistance he has given us in this way.

Through the generous contribution of several of our members, our collection now amounts to probably 500 or 600 species which practically fill up the dozen drawers we bought at the beginning of the year.

An innovation introduced this year was the filing of all papers read at our meetings so to be accessible for future reference.

The report of the Treasurer will now be submitted to you, and also that of our Curator and Librarian who will give you many details as to the exact condition of our collection of insects.

Submitted on behalf of the Council.

(Signed) G. CHAGNON,
President.

The Treasurer then submitted his report, showing a balance on hand of \$47.52.

The Librarian and Curator then presented his reports showing that valuable contributions towards the collections of the Branch had been received; from Mr. Winn 98 specimens of Lepidoptera and 134 specimens belonging to other orders, from Miss Emily L. Morton a very valuable donation of eight hybrids of her own rearing, from Mr. Chagnon 94 specimens of Diptera representing 51 species, from Mr. Norris 43 specimens of Lepidoptera, from Mr. Stevenson 20 specimens of butterflies, from Mr. Denny 13 specimens of butterflies. Mr. Beaulieu has promised a large number of specimens of Coleoptera and Mr. Lyman a number of Western Lepidoptera.

The library is still of very modest proportions but the following additions have been made : Howard's "Insect Book," by purchase ; "The Crambidae of North America," by C. H. Fernald, A.M., Ph.D., presented by the author ; "Annotated Catalogue of the Butterflies of New Hampshire," by Wm. F. Fiske, presented by C. M. Weed through H. H. Lyman.

It was then moved by Mr. A. Griffin, seconded by Mr. A. F. Winn, that the reports be received and adopted. Carried.

The Secretary then read the Annual Address of the President, after which the election of officers for the ensuing year took place with the following result : President, Charles Stevenson ; Vice-President, A. E. Norris ; Librarian and Curator, A. E. Norris ; Secretary and Treasurer, G. A. Moore ; Council, Henry H. Lyman, G. Chagnon, D. Brainerd.

On motion of Mr. Lyman, seconded by Mr. Griffin, the night for meetings was changed from the second to the first Tuesday in the month, as in the early years of the Branch.

On motion of Mr. Lyman, seconded by Mr. Winn, \$5.00 was voted for the purchase of early volumes of *The Canadian Entomologist* for the Branch Library.

Messrs. Stevenson, Chagnon and Winn were elected a Field Day Committee.

Mr. Lyman then presented 55 specimens of Lepidoptera, chiefly western, for the Branch Cabinet.

Mr. Lyman read a paper entitled "What is a Genus?"

Mr. Norris then exhibited, with the help of Mr. Griffin and the lantern of the Natural History Society, a collection of excellent coloured slides of Lepidoptera.

On the adjournment of the meeting the members were entertained with refreshments by Mr. Griffin.

G. A. MOORE,
Secretary.

REPORT OF THE QUEBEC BRANCH.

PRESIDENT'S REPORT.

The Quebec Branch of the Entomological Society of Ontario has entered upon the sixth year of its existence.

We still have a goodly number of members though several of our young people have entered business houses and can no longer give attention to entomology. Some of our members have moved to distant parts of the country and some have been taken away by death. We here record with sorrow the demise of Miss Bella Thompson. After a long illness, borne with much patience and resignation, she departed this life on the 22nd of June last. The friends of this lady have our deep sympathy.

The weather during the past season has been remarkably variable—too cold and wet for insect life to flourish. We had, however, a very enjoyable field day on the 9th July at the Island of Orleans. But few insect captures were made, but some pleasant hours were spent in the grounds of Mr. and Mrs. Morgan and those of the Hon. R. and Mrs. Turner. On this occasion we found the oak trees infested with the Snout-beetle *Balaninus nasiceus*, Say.

A specimen of the rare wasp, *Vespa rufa*, Linneus, was taken on the island, and a nest of *Vespa Germanica*, Fabr, was discovered there.

Vespa arenaria, Fabr, was abundant in the woods round Fort No. 2, Levis, in August ; and *Pamphila Manitoba*, Scudder, was seen in the same month and in the same locality.

A tortoise beetle new to the province has appeared at Levis this year. It feeds upon the burdock and the Canadian thistle. Specimens of this insect have been sent to the British Museum for identification.

REPORT OF COUNCIL.

The Branch now includes 32 members (24 adults and 8 juniors.)

The treasurer's report is submitted, and will no doubt be found satisfactory.

The continued rainy weather of last summer prevented the members from having many field-days but a very enjoyable one was held on the Island of Orleans on the 9th July.

Our thanks are due to the authorities of Morrin College for having continued to allow us the use of their rooms for our meetings.

CRAWFORD LINDSAY,
Sec-Treas.

The following were elected officers :—President, Rev. Dr. Fyles ; Vice-president, Miss E. MacDonald ; Council, Hon. R. Turner, Rev. F. G. Scott, Mrs. R. Turner, Miss Bickell, Miss Freeman ; Secretary-Treasurer, Lt.-Col. Crawford Lindsay.

REPORT OF THE TORONTO BRANCH

Of the Entomological Society of Ontario for the year 1901-2, ending April 30, 1902. Read at the Annual Meeting, held in the Education Department Building, May 16th, 1902. Mr. E. M. Walker, vice-president, in the chair.

GENTLEMEN :

During the past year ten meetings have been held, and the following papers have been read before the Society :—

- " A Collecting Trip in South-western Ontario " E. M. Walker.
- " An Evening at the Milkweed " A. F. Winn.
- " Butterfly Collecting in 1901 " J. B. Williams.
- " Some Interesting Lepidopterous Larval Habits " Arthur Gibson.
- " The Canadian Stick Insect " J. B. Williams.
- " On Crickets " E. M. Walker.

Two meetings were occupied with the "Exhibition of Specimens," and at the special meeting in November addresses were given by Mr. Arthur Gibson and Dr. Fletcher, of Ottawa, and by Mr. H. H. Lyman, of Montreal, these gentlemen having kindly arranged to be present on their way back from the London meetings. A number of the Natural History Society members came to this meeting, as well as those of our own Branch, and a very pleasant evening was spent in listening to and conversing with our three visitors.

We arranged for a Field Day to High Park on the 24th of May, 1901, but, unfortunately, the weather made any expedition of this kind impossible ; however, we subsequently went to High Park for the afternoon of June 22nd, and had an interesting and successful afternoon.

A number of additional drawers in the Education Department museum have been corked and glazed for the collection of insects that the Society is making for the Department, and we have now plenty of space to re-arrange the collection in a satisfactory manner, and provide room for all the orders.

The Orthoptera, Odonata and diurnal Lepidoptera have already been re-arranged.

We have subscribed for the "Journal of the New York Entomological Society," the "Entomological News" and the "Bulletins of the New York State Museum."

The Branch presented a series of the very beautiful plates of scale insects, from Bulletin No. 46, to the Education Department museum, and Mr. Boyle, the Superintendent of the museum, has had them framed and hung up in one of the rooms.

Valuable papers on entomological subjects have also been received from the Central Experimental Farm at Ottawa, the United States Department of Agriculture at Washington, and from several other sources.

The attendance at our meetings is but small, and we have only added one new name to our membership during the year. Most societies of this kind, however, have their "ups and downs," and we must hope that by next year we shall be able to report that the attendance and membership are going up.

E. M. WALKER, Vice-President.

J. B. WILLIAMS, Sec-Treasurer.

TORONTO, May 16th, 1902.

The following officers were elected for the present year :—President, E. M. Walker ; Vice-President, G. M. Stewart ; Secretary-Treasurer, J. B. Williams ; Librarian and Curator, J. H. Webb ; Members of Council, Arthur Gibson, John Maughan, jr.

REPORT OF THE TREASURER.

Financial Statement of the Treasurer of the Entomological Society of Ontario for the year ending August 31st, 1902.

RECEIPTS.

Balance from previous year	\$ 483 05
Members' fees	388 22
Government Grant	1,000 00
Proceeds from sales, Pins, Cork, &c.	14 23
Proceeds from sales, Entomologist	130 25
Advertising	28 43
Interest	15 32
Total	\$2,059 50

EXPENDITURE.

Printing	\$ 731 34
Expense, Annual Meeting & Reports	270 97
Salaries	375 00
Rent	165 00
Library	36 98
Expense—sundry	66 03
Balance	414 18
Total	\$2,059 50

Auditors : { W. H. HAMILTON.
J. A. BALKWILL.

Treasurer : JAS. H. BOWMAN.

REPORT OF THE LIBRARIAN AND CURATOR.

FOR THE YEAR ENDING 31ST OF AUGUST, 1902.

38 volumes were added to the Library during the year, made up as follows :—

Twenty-one bound volumes of Government Reports, Proceedings and Transactions of Scientific Societies, Institutions, &c., the most important of which is, the 21st Annual Report of the U. S. Geological Survey for the Years 1899 & 1900, in seven large volumes, profusely illustrated, with maps, and accompanying them was, the Geological and Mineral Resources of the Copper River District, Alaska ; also, Reconnaissances in Cape Nome and Norton Bay Regions, Alaska, 1901.

By purchase : The three first volumes of the Lepidoptera Phalænæ in the British Museum, with plates. By Sir George F. Hampson, Bart.

By exchange : The first two volumes of British Lepidoptera. By J. W. Tutt, F.E.S. Twelve volumes were bound, bringing the total number of volumes now on the Register up to 1,760.

41 books were issued to local members during the year.

Some valuable additions were made to the Society's native collection ; and several rare and interesting specimens were secured in this locality, whilst some indicate the spread of injurious species.

Respectfully submitted.

J. ALSTON MOFFAT.

REPORT OF THE BOTANICAL SECTION.

The Botanical Section met for organization on 31st May, when the following officers were elected for the year 1902 :—Chairman, Rev. Dr. Bethune ; Vice-Chairman, J. Dearness ; Secretary, J. A. Balkwill.

The attendance at the meetings, which were held every second week, was very good, and a considerable interest has been maintained during the season.

An outing to Thompson's bog was held on July 11th, but, owing to the wet weather, only a small number attended. The bog was overflowed with water, and many parts could not be visited. A number of interesting plants were brought home, but no new plants were discovered.

Mr. J. H. Bowman reported an outing by Rev. T. C. Scott and himself, when the following fungi were gathered, cooked and eaten : *Cantharellus cibarius*, *Russula heterophylla*, *Psaliota placomyces*, *Lycoperdon cyathiforme* ; also having seen a very large *Amanita muscaria*, with a number of dead insects near by, killed by eating the poisonous mushroom.

During the season a large number of plants were brought to the meetings, examined and identified.

J. A. BALKWILL,
Secretary.

REPORT OF THE MICROSCOPICAL SECTION OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The Microscopical Section of the Entomological Society of Ontario takes pleasure in presenting its twelfth annual report.

Since the last annual report five new members have been added to the membership roll of the Section, namely : Messrs. C. W. Horton, G. Escott, N. Beal, J. Tanton and C. Parsons.

The re-organization meeting was held on the Twenty-eighth of September, 1901, when the following officers were elected :—

Prof. Jas. H. Bowman.....	Chairman.
Prof. J. Dearness.....	Vice-Chairman.
Mr. E. A. Brown.....	Secretary.
Profs. Bowman & Dearness and Mr. C. W. Horton.....	Executive Committee.

During the past winter (the Microscopical Section resolves into the Botanical Section during the summer months) sixteen regular meetings were held, with an average of ten members, as well as visitors. At the request of the Students of the Western University, a number of the members of the section assisted in the programme at the annual *Conversazione*. In addition to the exhibition of a number of the slides in the Society's collection, Prof. Dearness demonstrated "Life in a Drop of Water" and "Circulation of Blood ;" Dr. Bethune exhibited a number of slides of Insects or their parts, while Prof. Bowman prepared Crystals on the spot and, by means of the polariscope, brought out their beautiful colors.

From time to time throughout the season papers were read or addresses given on the following subjects :—

Pond Life.....	Prof. Bowman.
How Best to Mount Seeds for Microscopic Examination.....	Prof. Dearness.
On the Theory of Colored Light Rays.....	Prof. Bowman.
How Best to Mount Sections of Cloth.....	Prof. Bowman.
On Sertularia.....	E. A. Brown.

Microscopic Examination of Plant Hairs.....	Prof. Bowman.
On the Wet Mounting of Pollen.....	Prof. Dearness.
On the Dissimilarity of the Muscular Tissue of an Insect and a Higher Animal.....	Prof. Dearness.
Mono-bromide of Camphor Crystals and Methods of Making and Mounting....	Prof. Bowman.
Notes on the Life History of <i>Trichina Spiralis</i>	Prof. Dearness.
Practical Study of Branchippus, Cyclops and Cyprus.....	Prof. Bowman.
Properties of the New Metal Radium.....	Dr. Bethune.
The Respiration of <i>Spirigæ</i>	Mr. R. W. Rennie.
On the Local Distribution of <i>Riccia Natans</i>	Prof. Bowman.
On the Way in Which <i>Riccia Natans</i> Passes the Winter	Mr. R. W. Rennie.

In addition to the above papers, the members exhibited many beautiful slides of crystals, sections of wood and insects.

At one of the meetings Mr. Law drew the attention of the Section to the difference in composition of specimens of sand from Santa Pensacola (Florida) and Sable Island. The granules of the former were sharply cut, of a whitish color, making beautiful polariscopic objects, while the latter were found to be composed of Silica stained by the action of some metallic oxide and presented a rounded appearance. Dr. C. Abbott, who for some time has been conducting experiments in Micro-photography, exhibited some interesting and instructive photographs, which go to show the advantages to be derived from the union of the Microscope and the Camera.

It is the earnest desire of each member that, during the near future, there may be a large increase in the ranks not only of this Section, but of all societies that have for their motive the advancement of science, for the field of observation and study is large, while as yet the laborers are comparatively few in number.

All which is respectfully submitted.

JAS. H. BOWMAN,
Chairman.

EDGAR A. BROWN,
Secretary.

REPORT OF THE ORNITHOLOGICAL SECTION.

During the year just past the Ornithological Section has held nine regular meetings at which the attendance has averaged over six.

At these meetings many interesting subjects have been brought up and discussed and many valuable notes recorded. One bird new to Canada was reported, viz. the White-eyed Vireo, by W. D. Hobson, Woodstock; and two others, the King Rail and the American Scoter, which are new to the County of Middlesex, were also noted.

Two Mammals new to this district were also recorded by Mr. Robert Elliott: an undetermined Lemming and the Pine Mouse. Specimens of these were shown at one of the meetings and they were stated by Mr. Elliott to be common, though no one else had succeeded in taking any.

Three families of birds, the Vireos, Swallows and Warblers, have been studied at the meetings and twelve papers have been read; two of these were published in "The Auk" and most of the others have been or will be published in "The Ottawa Naturalist." These papers were as follows:

"The Bobolink's love for its home"; "The Prairie Horned Lark nesting in New Brunswick"; and "a Hybrid between the Sheep and the Deer," by Wm. H. Moore, Scotch Lake, N. B.

"The American Scoter in Middlesex County"; "Nesting habits of the Ipswich Sparrow"; "The spots on the eggs of the Great Blue Heron"; "Early Nesting in 1902," by W. E. Saunders, London.

"The Cardinal an established resident of Ontario," and "Cubic contents of the eggs of the Buteos." by J. E. Keays, London.

"Recollections of the Passenger Pigeon," by Dr. Bethune, London,

"The Parula Warbler and its variety," by Robert Elliott, Bryanston.

"The White-eyed Vireo at Woodstock," by W. D. Hobson, Woodstock.

Work has been continued on the list of the birds of Middlesex, which is not yet completed, and the migrations of birds have been studied during their progress as usual.

Since our last report was made, addresses and lectures have been delivered by our members as follows: to audiences in Sarnia, Toronto and Brantford; before the Field Naturalists' Clubs of Ottawa and Guelph; and in London to one assembly of Teachers, two Farmers' meetings and four Church associations.

All which is respectfully submitted.

W. E. SAUNDERS,
Secretary.

Mr. Saunders exhibited specimens of the Lemming referred to in the foregoing report and also of several species of Mice. Prof. Lochhead remarked that the Ornithological Section was performing a very good work, especially by the popular lectures on Birds that were given by some of the members. He noticed that a great interest had been thus awakened at Guelph and would he was sure be long maintained.

REPORT OF THE GEOLOGICAL SECTION.

The Section continued its weekly meetings as heretofore, studies of geological specimens and addresses on geological subjects furnished instruction for the members of the section. A new and most successful feature of the year's studies was a monthly meeting for blow pipe analysis of various minerals. This department was in charge of Messrs. Dempster and Smith. Dr. W. J. Stevenson also gave a most instructive lecture on the tests for a number of minerals by wet assaying. Visits were made to places of interest, as has been the custom in past years. Dr. Woolverton visited the neighborhood of the Sandhills of the Sauble, and discovered a new outcrop of the Hamilton series in that vicinity. Mr. Percival visited the glacial markings on Kelley's Island. Mr. Smith the Rainy River and other North West Ontario districts. Besides these reports made by our own members, interesting descriptions of Temiscaming district were given by Mr. Geo. Taylor, and the Atlin, British Columbia by a resident mine owner of that northern region.

Dr. Woolverton kept the table supplied with numerous interesting specimens to illustrate the papers read.

Articles on geological subjects were read by different members of the section.

Dr. Woolverton's report on the Sandhills of the Sauble summarized was as follows. The sands blown from the beach form hills of a considerable height. The width of district covered by these dunes is about 2 miles. On the edge of the sand ridges a fossil bed of the Hamilton period was observed; numerous specimen of *Zaphrentis prolifica* were visible.

MR. PERCIVAL'S REPORT ON THE GLACIAL MARKINGS OF KELLEY'S ISLAND.

Kelley's Island is situated in Lake Erie off the north coast of Ohio. The glacial groove is situated at the north end of the island in the limestone rocks of the district. The portion of the groove preserved is 33 ft. across and apparently 17 ft. deep. The groove presents a series of corrugations merging into each other by beautiful curves. The whole appearance is that of Corinthian columns lying prostrate side by side. On what is known as "Inscription Rock"

are sculptures made evidently by the Indians in times long past. The figures denote historical events of deep interest, relating to the conquest of the island by the Iroquois. These sculptures, found on the south side of the Island, were deeply engraved and though now rapidly weathering away, are yet easily traceable.

MR. SMITH'S REPORT ON THE EAGLE LAKE MINING REGION.

The Eagle Lake District is reached by C. P. R. from Fort William and lies some forty miles east of Rat Portage. Eagle Lake, about where the group of mines and prospects comprising the mining division are located, is some 90 miles in length and ranges from 1 to 13 miles wide. The course of the lake is very tortuous and many islands are met with. The scenery presented by the sheets of pure blue water, granite bluffs and evergreen blanketed hills is of a degree of picturesqueness not soon to be forgotten.

The distributing point of the lake is at Vermilion Bay, a small C. P. R. by-station consisting of half a dozen buildings and shacks. There is another C. P. R. station known as Eagle River on a river of that name tributary to the lake. At the north end of the lake proper a Hudson Bay post is located. A few trappers, prospectors and Indians are the only other representatives of human kind in that great region. The Provincial Department of Crown Lands has surveyed the country sufficiently to make known in a general way the configuration of the lake, but the details of the topography and geology of the land about it are still generally unknown.

It is agreed among students of the subject that what is now known as the "Height of Land" extending through Quebec, Northern Ontario and Keewatin in the form of a horse-shoe reached an altitude rivaling that of the Appalachian system which gives shape and position to the eastern half of this continent. Owing to changes of rainfall and temperature, a great tract which centres about the Height of Land came under a thick cap of snow and ice which, in its movements, ground down the hills, filled the valleys and scooped hollows which filling with water became lakes. This theory, which has been very briefly and inadequately put, accounts for the larger features as well as for many of the minor phenomena which characterize our great Northland.

It is the theory of the writer that Eagle Lake owes its existence to a branch of the great Keewatin Glacier, which formed west of Hudson's Bay and several hundred miles due north of the lake.

A careful study of the map indicates that the branch referred to passed in a general south-easterly direction sending lateral divisions to the north-east and south-east. The northern shores of the lake are generally destitute of soil which may be accounted for by the comparatively recent retirement of the glaciers and to water erosion facilitated by the heavy rainfall and the undulating character of land.

A number of rocks picked up by the writer were found to consist of specimens of basic gray granite, red granite, talcose hornblende schists of a green color and black trap.

The gray granite was found 100 feet from the surface. It was overlaid by the red variety which in turn gave place to the green schist. The eruptive rock was found on an island facing the granite and schist outcrop. The formation of the granite in the outcrop was anticlinal *i. e.* tipped upwards from the lake, while the schist layers above appeared to dip in the reverse direction. The basic granite shows clear indications of decomposition in exposed parts where the felspar is broken down into kaolin giving the rocks a whitish cast.

At many points are to be seen the outcrops of quartz veins found either as stringers or as a single vein (which may be two or three feet wide.) When the quartz is in stringers the filling matter is green schist, similar to that before mentioned. The quartz carries small percentages of mineral *i. e.* magnetite or black sand, copper and iron pyrites, zinc blende and

native gold and silver. By pulverizing the quartz in a mortar and panning, the operator will frequently obtain colors (or minute specks of pure flour gold) in these veins. From a number of them there have been taken near the surface splendid specimens of free gold; some small samples, running as high as fifteen or twenty dollars in gold values, of this kind do not, however appear to obtain at the greater depths.

When the gold is found in a network of fine stringers a disproportionate body of barren matter must be excavated at great expense in order to procure the rock carrying gold. Two miners working in a tunnel are able to take out about a ton per day.

When the quartz-vein is compact, the prospector looks for values on the side adjacent to the foot wall. Assuming the average value per ton to be the same in each case it is obvious that the latter class of prospect could be operated much more economically than the stringer-quartz prospect. In the former the barren material may be left untouched except in so far as its removal may be necessary in the construction of passages. The pay ore may be kept free of extraneous material involving less cost in transporting and milling. The labor of sorting is also eliminated.

The majority of the prospect mines of the region are as yet prospect claims only. They have for the most part been staked by miners and prospectors of the district who have not the funds wherewith to carry on their work continuously until conclusive results are reached.

If the district is ever to produce gold in paying quantities, capital must be invested there but subject to conditions. If a mine is capitalized to a greater extent than is reasonably necessary to pay expenses for the period during which it is decided to work it, there is usually a great temptation on the part of directors and managers to spend the company funds too lavishly. In the second place if the mine ever pays, its earnings must be divided among a greater number of shares than would be the case if the capital had been less, thus giving smaller dividends. Then the management of such mines must be put in the hands of capable and experienced men, who know all branches of their work thoroughly. Again, operations should at first be carried on on an exceedingly modest scale in order that, if no result obtains, the loss may be at a minimum. Investors may thus feel their way to greater expenditures of money. Most of the prospects contain only a very low grade of ore, so that all machinery introduced should be on that basis.

Summing up it appears to be only necessary for companies forming or about to form with the object of exploiting the region to capitalize moderately, engage trained and efficient men as foremen and superintendents, and to operate on a wholly conservative basis. The district may then become a regular contributor to the gold output of this country.

All which is respectfully submitted

GEORGE B. KIRK,
Chairman.

REPORT FROM THE ENTOMOLOGICAL SOCIETY OF ONTARIO TO THE ROYAL SOCIETY OF CANADA.

(THROUGH THE REV. C. J. S. BETHUNE, D. C. L., DELEGATE.)

The Entomological Society of Ontario has now completed its thirty-eighth year and continues to perform good work of a practical and scientific character. Its membership maintains a steady growth and there is a frequent demand for complete sets of its publications from various parts of the world. Its monthly magazine and annual reports contain the records of so much original research and investigation that they have become essential to the equipment of every student in this department of natural science.

During the greater part of the year regular meetings have been held in the Society's room

at London. On Tuesday evenings several young men have met for the systematic study of insects under the guidance of Dr. Bethune and Mr. Moffat; on Thursdays the Geological Section has continued, with unabated enthusiasm, to discuss the rocks and minerals of the surrounding country; on alternate Saturdays the Microscopical Section has met throughout the winter to investigate the hidden things of nature and study the beautiful forms which cannot be seen with the unaided eye. Once a month, on Fridays, the Ornithological Section, has gathered together at the house of Mr. W. E. Saunders; the numerous papers by its members, published in the *Ottawa Naturalist*, testify to the energy and zeal with which they have devoted themselves to the study of bird life. During the summer the Botanical Section took the place of the Microscopical and held many interesting meetings. One field excursion only was made to Komoka, a favourite collecting ground near London; it was thoroughly enjoyed by the few botanists and entomologists who attended.

The Branches of the Society at Montreal and Quebec, the former of which has flourished for twenty-eight years, report that they have had a very satisfactory season, regular meetings have been held and many excellent and interesting papers were presented; a few field days have also been found very enjoyable and have helped much in stimulating the ardour of those who attend them. The Toronto Branch, like that at Quebec, is now five years old, but it has not received nearly so much encouragement and support as its twin-sister in the lower Province. Why the "Queen City of the West" should furnish so few entomologist is difficult to understand; it has the advantage of many distinguished seats of learning, several extensive libraries, a number of scientific Professors, and a rich and easily accessible country for exploration. Notwithstanding their limited numbers, the members of the Branch have held frequent meetings, at which several excellent papers were read, and have made good progress in the formation of a collection of insects for the Ontario Department of Education.

A noteworthy feature of the Society's work is the delivery of popular lectures by competent members. Dr. James Fletcher has given a large number on insects, noxious weeds and nature study, in various places in Ontario, Manitoba, the North West Territories and British Columbia; Dr. Bethune has lectured, chiefly to school children and Horticultural Societies, in London and a number of towns not far distant, on noxious, interesting and beneficial insects; and Mr. W. E. Saunders has addressed teachers and other assemblies in Montreal, Ottawa and other places as well as in London, on the Birds of Canada. These lectures have been well attended and listened to with great interest, and will evidently do much to awaken and stimulate a love for natural history and a desire to know more about the wonders in plant and animal life that everywhere surround us.

The thirty-eighth annual meeting of the Society was held in London in November last, and was attended by the Hon. J. Dryden, Minister of Agriculture for Ontario, and a number of members from different places. The proceedings opened with a discussion on the San José scale, its ravages in Ontario and the best methods of keeping it under control; much useful information was given by Mr. G. E. Fisher, Provincial Inspector of Scale insects, Dr. Fletcher the Dominion Entomologist and Professor Webster, State Entomologist of Ohio. An evening meeting, to which the public were invited, was held in the Normal School building; the Hon. J. Dryden took the chair and gave the opening address, in the course of which he said that the Entomological Society was one of the best as well as the oldest of the associations aided by the Government of Ontario, that "we need its accurate work and we have been greatly aided and helped by it during all the nearly forty years of its existence, and no doubt shall continue to be helped by it during the years to come". The Rev Dr. Fyles, of Quebec, the President of the Society, gave an address on "The importance of Entomological Studies to the community at large", illustrating his remarks with a beautifully executed series of diagrams, the work of his own hand. He was followed by Dr. Fletcher, who spoke on "The value of nature study in

Education" and concluded with an exhibition of lantern slides of plants, insects and other natural objects. During the remaining session a number of valuable practical and scientific papers were read, these are published, together with the reports of the Officers, Branches and Sections of the Society, in the 32nd Annual Report recently issued by the Ontario Department of Agriculture.

This volume of 128 pages is illustrated with two plates, a portrait of the late Miss Eleanor A. Ormerod, and a series of figures of the Moth *Hyphantria cunea*, three maps and fifty-eight wood cuts in the text. The principal articles are papers on the Insects of the year 1901 by the Directors, Messrs. Young, Evans and Johnston, and by Professor Lochhead and Mr. J. A. Moffat. "The Painted Lady Butterfly (*Pyrameis Cardui*)" and the "Entomological Record," a new and highly important feature, which is to be continued annually, by Dr. James Fletcher. "The North American Fall Web worms," illustrated by the beautiful plate already referred to, by Mr. Henry H. Lyman. "The trend of Insect diffusion in North America", the "Imported Willow and Poplar Curculio," and a singular case of a Cheese mite living in the culture intended for the destruction of the Chinch-bug, by Professor F. M. Webster. Two useful papers by Prof. Lochhead on the "Hibernation of Insects" and "Nature Study Lessons on the Mosquito". A paper by Mr. J. Alston Moffat setting forth his reasons for believing that the Archippus butterfly, whose habits he has studied for many years, does not hibernate. Interesting papers on collecting and field work: by Mr. Evans on the attractive powers of an electric lamp; Mr. Winn on his wonderful captures at a clump of milk-weed at dusk; Mr. Walker on "A collecting trip in South-western Ontario," and Mr. Gibson on "A day at the Mer Bleue." Dr. Fyles contributes a paper on "Crickets"; Mr. Stevenson on "Commercial Entomology", and Mr. Williams on "The Food of the Grass Snake," which he finds to be Cut-worms. The volume closes with a report from the North-west (Canada) Entomological Society, by Mr. Gregson; and obituary notices of the late Miss Ormerod and Mr. Otto Luger, by the Editor.

"The Canadian Entomologist," the monthly magazine of the Society, is now in its 34th year of publication. The volume for 1901 contains 348 pages, and is illustrated with five full page plates and eleven figures from original drawings. The contributors number sixty-two, and represent Canada, the United States, England, Germany, Luxembourg and India. The principal articles may be classified as follows; Descriptions of new genera, species and varieties in Lepidoptera by Messrs. H. H. Lyman, A. G. Weeks, A. Busck and Dr. Wm. Barnes; Orthoptera by Dr. S. H. Scudder, Prof. A. P. Morse and Mr. A. N. Caudell; Hemiptera by Mr. E. D. Ball and Prof. H. Osborn; Diptera by Prof. T. D. A. Cockerell, Messrs. C. Robertson and D. W. Coquillett; Coleoptera by Prof. H. F. Wickham and Mr. H. C. Fall; Hymenoptera by Messrs. E. S. G. Titus, W. H. Ashmead, T. D. A. Cockerell and C. Robertson; Neuroptera by Mr. N. Banks; and Homoptera (Hemiptera) by Messrs. G. B. King and T. D. A. Cockerell. Eleven new genera and sub genera are described and 123 new species and varieties.

Papers on Classification and Systematic Entomology: Ontario Acrididae by Mr. F. M. Walker; lists of Lepidoptera from Alberta by Mr. Wolley Dod, from Southern Manitoba by Mr. E. F. Heath; the Moths of Manitoba by Mr. A. W. Hanham and the Butterflies of Nebraska by Mr. M. Cary; Cicadidae by Dr. A. D. McGillivray; the Genera and species of Coccidae by Professor Cockerell; the Genus Catocala by Professor G. H. French and Mr. O. C. Poling; Spilosoma congrua by Mr. H. H. Lyman; Generic names in Orthoptera by Mr. J. A. G. Rehn; discussions of Lepidoptera by Dr. H. G. Dyar, Prof. J. B. Smith and Prof. J. R. Grote; Staphylinidae by Dr. E. Wasmann; Coccidae by Mr. G. B. King; Collecting Notes on Kansas Coleoptera by Mr. W. Knaus; American Bees by the Rev. T. B. Morice and Professor Cockerell; The Genus Osmia by Mr. E. S. G. Titus; the Respiration of Aleurodes by Prof. C. W. Woodworth; the Xiphidiini of the Pacific Coast by Prof. A. P. Morse; Note on Bæus by Mr. W. H. Harrington.

Life histories of the following insects are given ; *Xylina Bethunei* by Mr. Lyman ; several species of *Hydræcia* by Mr. H. Bird ; the Green-house Leaf-tyer by Dr. Fletcher and Mr. A. Gibson ; the fall Canker-worm by Mr. D. E. Hinds ; several species of *Catocala* by Messrs. G. M. and E. A. Dodge ; *Nannothemis bella* by Mr. R. Weith and Prof. J. G. Needham ; and *Aretia virguncula* by Mr. Arthur Gibson.

In Economic Entomology there are important papers by Mr. E. D. Sanderson on Plant-lice affecting Peas, Clover and Lettuce ; Diptera bred from Cow manure by Dr. L. O. Howard ; the Exportation and Importation of Beneficial Insects by Prof. F. M. Webster ; the Insect Fauna of Human Excrement (a review) by Dr. J. Fletcher. Also a paper on the effects of Scorpion venom by Mr. O. W. Barrett.

NOTES ON THE SEASON OF 1902. (WESTERN QUEBEC.)*

BY CHARLES STEVENSON, MONTREAL.

The season commenced early with every prospect of a good time for the Insect-hunter, but the meteorological conditions soon became of such a nature that there was little sport for the Lepidopterist. The temperature was low with high winds and perpetual rains. However, on the 22nd June, when at Piedmont in the Laurentian Hills, I had the pleasure of adding a new species of butterfly to the Quebec list, which was identified by Mr. H. H. Lyman as *Coenonympha inornata* Edw. The day was anything but favorable for collecting, as there was no sunshine and several showers. But on a plateau at a high elevation behind "La Montagne," I caught five perfect specimens in twenty minutes time. On returning to the station I found that Mr. A. E. Norris who had gone off in another direction had caught a weather-beaten specimen. This insect has been recorded in Newfoundland, Labrador, Sault Ste. Marie and Lake Winnipeg in Canada, Montana and Minnesota in the United States. Dr. W. J. Holland, who possesses a large series of this species, says that the Newfoundland type is distinctly darker than those in the Northwest. Four of my captures are pale and one dark. By this capture in the Laurentians it seems probable that its range extends across the continent on the high grounds unfrequented by the Entomologist, and as these regions open up it may prove to be found fairly abundant from Labrador by the Laurentians, along the north shore of the Ottawa on to Lake Winnipeg and into the United States.

At the same place and date while grubbing among rotten stumps I found an interesting looking larva which was successfully reared to maturity, producing a fine specimen of a click-beetle, rare to us, *Pityobius anguinus* Lec. This calls to mind the capture of a very large Eyed-elater, *Alaus oculatus* Linn (Fig. 35) on the slopes of Mount Royal on the somewhat early date of the 18th May, resting on the trunk of a fallen tree.

When the Natural History Society visited Piedmont on the 7th June, a day of rain and drizzle, a few of us enthusiasts braved the elements and I was fortunate enough to get a syrphid fly new to the very fine collection of Mr. G. Chagnon and a moth *Mamestra later*, Gn. new to mine.

A specimen of the Hag-moth *Phobetron pithecium* A. & S. was obtained in sweepings on Mont Beloeil at St. Hilaire on the 9th July.

In the Coleoptera my last captures were :

Galerita janus, Fab., 25th May, Rigaud, Que.

Callida punctata, Lec., 9th July, St. Hilaire, Que.

Cychrus viduus, Dej., 11th July, St. Hilaire, Que.

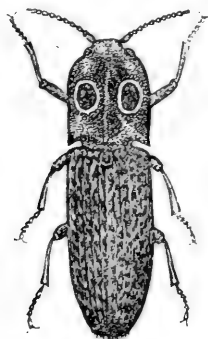


Fig. 35.

* Read before the Montreal Branch of the Entomological Society of Ontario.

One specimen was found by Mr. G. Chagnon and two by myself, the reward of an afternoon's scraping among dead leaves and rubbish.

Saperda mutica Say., 19th July, Chiamby Co., Que.

Neoclytus erythrocephalus Fab., 11th July, St. Hilaire.

Long-horns were very scarce throughout the season with the exception of *Typocerus velutinus* Oliv., which was quite plentiful.

Platyedema ruficornis Sturm, was very abundant in Laval Co. on the 11th May, when Mr. Chagnon and myself obtained over 150 specimens between us in a quarter of an hour.

Two weevils that live on water plants *Lixus rubellus* Rand, and *Lixellus filiformis* Lec., were captured while boating on the lake at Mont Beloeil, St. Hilaire, on the 9th July.

While rearing some *Csmoderma eremicola* larvæ I found that the attractive "Nimble fly," *Zelia vertebrata* Say., is its parasite.

The beautiful Crane-fly *Bittacomorpha clavipes* Fab., was very abundant along the banks of a stream running through the village of St. Hilaire, on the 11th July.

Specimens of the "micropterous" variety of the Chinch-bug *Blissus leucopterus* Say., were found at Rigaud on the 24th May and on Montreal Island during July.

Lepidopterous larvæ were somewhat scarce, especially such ones as the Tent-caterpillars *Oliocampa americana* Fab., and the Tentless *C. distria* Hbn. At St. Hilaire the water hemlock borers *Gortyna marginidens*, were plentiful, but those of the burdock *G. rutila*, usually so common on Montreal Island, were fewer than in former years, and Cut-worms have not been prominent. But the Tussock-moth caterpillar is spreading among the shade trees of Montreal to a dangerous extent, and it is to be hoped that the citizens will awaken to the fact, before it is too late.

NOTES ON THE SEASON OF 1902.

By J. ALSTON MOFFAT, LONDON, ONT.

To the collector of natural history specimens, the weather is of the first importance; and in no other of the departments of natural history is the collector made to realize the close dependence there exists between the weather and success, than in botany and entomology, whilst entomology seems to be the more sensitive to adverse influences of the two. Hence, a cool, wet summer, although it will produce luxuriant vegetation generally, may, nevertheless, place Paris Green and Bordeaux mixture at a discount.

Perhaps never in the history of his career, has that antiquated subject of reference, "the oldest inhabitant," so completely failed to recall from the dim and distant past, a summer to correspond with that of 1902 in this locality, for uniform coolness and frequent rains, and its natural compensation, a general reduction in the number of insect pests. To the Entomological collector the season may be pronounced a complete failure. During a ramble in quest of specimens, he might see the landscape adorned with flowers, and yet find no butterflies there to give animation to the scene. But as has often been observed amidst a general scarcity, some unusually good finds have been made.

Four years ago Mr. Bice secured a specimen of that rare Sphingid *Deidamia inscripta*, Harr, which he generously donated to the society's collection, the only representative of the species yet there; but early this season he took another in his own house, whilst yet another was taken by Mr. J. Tanton in a different part of the city—a notable incident in so rare a species. Mr. Bice also took a fresh specimen in perfect condition, of that attractive Sphingid which is rarely met with here, *Ampelophaga versicolor*, Harr.

That large and attractive southern butterfly, *Papilio cresphontes*, Cram. Fig. 36, was more frequently seen and larger numbers of it taken than for many years back ; which seems rather strange, considering the character of the season.

That singular looking *Hemipteron Ploiaria brevipennis*, Say. *Emesa longipes*, Fab., whose appearance suggests a compound between the Mantis and Walking-stick ; has been more fre-

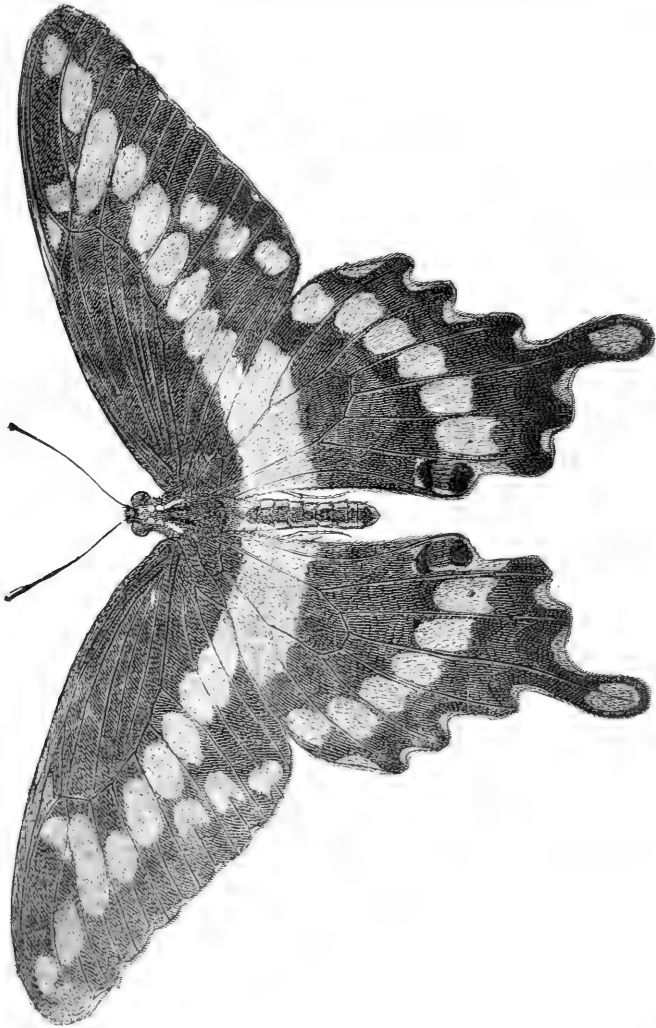


Fig. 36. *Papilio cresphontes* ; colours, black and yellow.

quently observed, and more interest taken in it, and enquiries made about it than ever before, some fine specimens of it having been brought to me for determination.

As an illustration of the spreading of injurious species, Mr. C. P. Butler of London, Ont., reported his finding in large numbers *Crioceris 12-punctatus*, Linn., on his asparagus the early part of August. This is the first observation of it reported in this locality ; and so far as observation went, it was then confined exclusively to his neighborhood. Mr. Butler kindly provided the society with a liberal supply of specimens for its collection. There are two species of injurious asparagus beetles, *Crioceris asparagi*, Linn., and *C. 12-punctatus*, Linn., and they differ considerably in their appearance, and to some extent in their habits. *Crioceris asparagi*

has been on the Canadian list, as having been known to be taken in Canada for fourteen years or more, but it has not yet been reported as having been seen in this city or vicinity, whilst *C. 12-punctatus* will soon prove itself to be the more abundant and destructive species of the two.

Mr. E. M. Walker's observations on the spreading of *Pieris protodice* (Fig. 37) eastward, given in the Thirty-second Annual Report of the Entomological Society of Ontario, page 87, aroused my interest in that butterfly, and I requested the collectors in London to be on the look-out for it ; but it was not observed here by any of them. The season was unfavorable for *rapae* (Fig. 23), as it was not nearly so plentiful as in ordinary years, and it may well be regarded as yet more unfavorable for *protodice*, which has been designated "The Southern Cabbage Butterfly." In 1895 *protodice* was reported as plentiful at Windsor, Ont. It was also seen at London where a few specimens of it had been taken

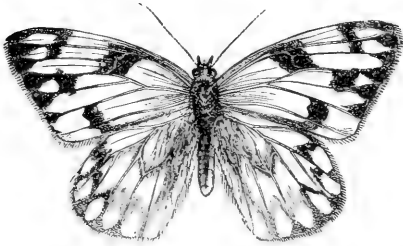


Fig. 37. *Pieris protodice* ; colours, white and black.

the previous year. Since then it has not been observed in London. No further notice of its movements has been taken, so far as I have observed, until Mr. Walker reported it as plentiful at Leamington, Chatham and Sarnia. Which seems to indicate that it is recovering lost ground eastward, but that its appearance at London in 1894 and 1895 should be regarded as a sporadic outbreak, rather than as a permanent advance. The only fresh captured specimen of *protodice* that I have seen this year came from Leamington.

Desiring to locate its present boundary eastward, I made a trip to Glencoe, which is about half way between Chatham and London on the Grand Trunk Railway, but found only *rapae* there. So it has not yet got thirty miles east of Chatham ; and if it is gradually extending eastward it will be several years yet before it reaches London along that line. But I am under the impression that it will increase more rapidly along Lake Erie shore than it will inland, and my intention was to visit Port Stanley in order to see if it had reached that locality, but a favorable opportunity did not present itself.

If *Pieris protodice* is actually recovering lost ground, how slowly it is spreading eastward as compared with the rapid advance of *P. rapae* westward upon its first introduction into the country. First taken at Quebec city in 1863, and considered likely to have been landed there from Europe three years earlier, it reached Montreal in 1867. Belleville and Trenton in 1872. Port Hope, Toronto and Dundas in 1873. Paris and London in 1875, occupying western Ontario and extending into Michigan in 1876. Thus in thirteen years time it spread from the City of Quebec to the Detroit river. And the marvellous thing about it was that as *rapae* advanced *protodice* disappeared, not leaving a trace of its previous existence in the locality. Now it has taken six years for *protodice* to get from Windsor to Chatham, and then it has not got the whole ground to itself, but only getting to be in the majority. Clearly indicating that *protodice* is meeting with a resistance of some kind to the reoccupying of its lost ground, which *rapae* did not encounter in its progress westward.

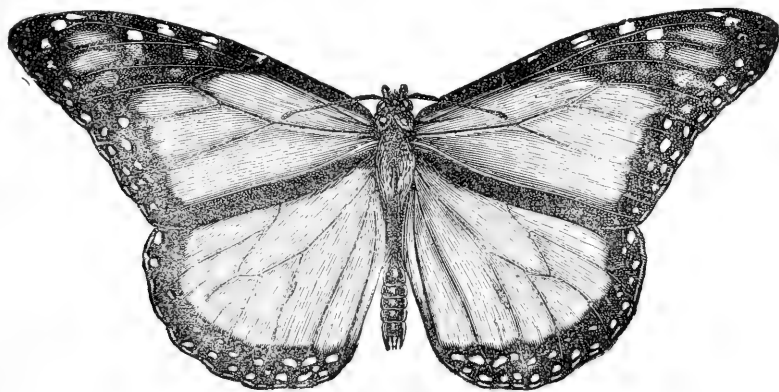
This is an occurrence of the most profound interest to every student of biology, and well worthy of their closest attention and consideration. And in it may yet be found a key to the solution of some of the most obscure and difficult problems of the day, in their relation to the science of life in natural history.

A FEW NOTES ON DANAIS ARCHIPPUS.

BY H. H. LYMAN, MONTREAL.

Were it not for its commonness, I think that this butterfly would be considered, as suggested by the common name proposed by Dr. Scudder, the Monarch of North American butterflies.

It is so large, so strong of wing, and its colours are so rich that its pre-eminence is very marked, and it is so abundant, and so widely distributed that it must be familiar to even the most casual observer of nature. (Fig. 38.)



(Fig. 38.)

As boys, my brothers and I gave it the name of the "Large Striped Butterfly," *Limenitis Disippus* being the "Small Striped Butterfly," and these names had certainly the merit of being descriptive.

But while this butterfly is so common and so easily reared, there is, perhaps, no butterfly about whose life history naturalists have disputed more keenly, and notwithstanding all the arguments and the evidence gathered, the facts have never been made sufficiently clear to preclude further dispute. This shows what a fascinating study is Entomology. There is always something still to be learned about even the commonest species, and everyone, no matter how limited his or her means and time may be, can always add to our knowledge, if only the effort be made in the right way.

The points about which the dispute has chiefly raged are three :

- 1st. Does it hibernate ?
- 2nd. How many broods are there ?
- 3rd. How long do the individuals usually live ?

Mr. Wm. H. Edwards has contended that the life history of this butterfly differs in no essential particulars from that of other hibernating species ; that in Virginia there are four broods, the butterflies of only the last hibernating, and appearing on the wing early the next spring, mentioning the last of March as the time of first appearance, eggs being laid last of April or beginning of May, the 2nd May being mentioned, and the first brood from the hibernators appearing at the end of May.

The late Dr. Riley wrote, "They commence depositing eggs in the latitude of St. Louis during the fore part of May . . . Butterflies from these eggs begin to appear about the middle of June."

Dr. Scudder claims that in the north (Query : What is "the north" ? and where does it begin in coming up from "the south" ?) the species is only single brooded, that the country is

annually colonized by immigrants from the south which lay eggs up to the middle of August ; that the butterflies never mate the first season ; that some attempt hibernation, but that while hibernation may be successful in a few localities in southern New England, usually every hibernator north of the annual isotherm of 40° perishes ; that large numbers migrate south, and pass the winter in an active state, that the butterflies live for more than a year, and mingle on the wing with their progeny of the succeeding season, from which it has been suggested that its common name should be "the Tramp" or "the Patriarch."

Mr. Moffat, in the interesting papers which he has contributed to our Annual Reports, accepts Dr. Scudder's theories, and even adds to them. He appears to claim that all butterflies observed ovipositing in the north have come from the "south," but believes that there are several broods in the south, and that each of these broods is controlled by the same strong desire to travel northward, and that there are thus successive waves of immigrants which lay eggs and produce fresh butterflies, and that these successive waves account for the egg layings from "about the first of June and before," till such late layings as produced the butterfly which Mr. Moffat had emerge on the 6th of November, but Mr. Moffat wisely declines to attempt to draw the line between north and south for this butterfly.

There is one point, however, which is not made clear, and that is whether Mr. Moffat believes that the butterflies which emerge in July from eggs laid by the first arrivals in Ontario continue on the wing in the locality where produced, or also emigrate to still more northern latitudes, and if the latter, whether these having come from the "south" mate and oviposit in these more northern regions.

My own experience of this butterfly extends over many years, but I have probably not given it the same careful study that Mr. Moffat and others have done. I have, however, approached the subject with an unprejudiced mind, and have always been open to conviction, but at the same time confess that by natural disposition I am inclined to look with suspicion upon any theory which attributes abnormal causes to observed phenomena.

The facts, so far as I have observed them, are that in the early summer worn and discoloured females appear on the wing, and are seen ovipositing. These worn and discoloured specimens soon disappear, and no such specimens have ever been seen by me after about the middle of July. What becomes of them ? Do they die here after laying their eggs, or do they press on to the "north" ?

On many occasions I have first seen these immigrants at the end of June or 1st July. At Au Sable Chasm, on 1st July, 1895, I saw the species for the first time that year, and secured two eggs which I saw laid, and a butterfly reared from one of these eggs emerged 31st July. Doubtless they sometimes arrive earlier. Mr. Winn has seen them earlier. I do not remember to have done so in the neighbourhood of Montreal, prior to 1899, and have frequently searched the Milk Weeds in June for eggs or larvæ without success.

Once only I found a larva nearly full grown, on the mountain, which must have come from an egg laid about the middle of June, but in 1899, on the annual excursion of the Natural History Society of Montreal to Montfort, on 10th June, this butterfly was seen flying, and Mr. Norris found an egg and gave it to me. This egg hatched about the 11th, pupation occurred on the 29th, and the butterfly emerged on the 10th July.

On 1st July of that same year, on an outing of the Montreal branch to Chateauguay Basin, I took a pair in coitu. The male was bright, but the female worn and discoloured. I kept them alive in a cage with the food plant, and secured one or two eggs, and a butterfly reared from one of them emerged on the 4th August.

In 1896 I went down to Portland, Me., on 29th August, and during a ramble on the 30th found a larva of the species nearly full grown, which pupated on 7th September. Allowing the usual time for the larval period, the egg could hardly have been laid before the 15th

August. But what butterfly laid it? Certainly not one of the worn and discoloured spring immigrants. No one, I am sure, ever saw one of them laying eggs as late as the middle of August. What reason is there against supposing that it was laid by a butterfly which emerged about the end of July or beginning of August from an egg laid by an immigrant the last of June or beginning of July?

I accept the colonization theory, but I see no reason to accept the extraordinary hypothesis that this species practises celibacy for a year from its birth.

In regard to the autumnal gatherings, which I regret to say I have never observed, Mr. Moffat's belief seems to require our acceptance of an intelligence scarcely less than human. He speaks of the working of their "minds," claims that a rendezvous is selected, but whether by a representative "committee on place of meeting" duly elected for the purpose, or is named by some Napoleon or Lars Porsena among them, we are not told, and that then messengers are sent forth east and west and north, if not south, to summon the array.

Such a belief is, to me at least, incredible. I have never seen one of these gatherings, but do not doubt that they frequently occur, but I think that if they occurred regularly every year, and that if annual flights to the south were also of yearly occurrence many more observations would have been made and recorded, on account of the size and conspicuous appearance of the species, but I see no reason to attribute anything semi-miraculous to these gatherings.

It is well known that in some years this butterfly occurs in much greater numbers than in others, and it would seem probable that marked swarms only occur in years of great abundance. That a southerly migration also sometimes takes place, may also be conceded but it is not necessary to suppose that scouts are sent out to gather the hosts.

The migration would begin at the furthest point north that the species extended to, and would begin earliest at that point. Naturally, as they flew south they would meet milder climatic conditions, and so be tempted to linger by the way, and to foregather with those inhabiting these regions. That the butterfly has a marked odour is well known, and it seems probable that the odour from these increasing swarms would be carried a considerable distance by the wind, and so tend to attract still more, either from east or west, to these gatherings, of which there are probably not one but many.

Because Dr. Thaxter has observed it wintering, like "the very best society," in the Gulf States, Mr. Moffat concludes that it does not hibernate anywhere, but surely this is too weighty a conclusion to draw from such slender premises.

The life history of this butterfly will never be settled by argument, but the main facts could easily be learned if a sufficient number of intelligent persons would devote a little time to observing the species, and jotting down their observations at the time, as nothing is so unsatisfactory as trusting to one's memory in regard to scientific facts. And to this end I would suggest the issuing by the Society of a leaflet, printed on stout foolscap paper, with one of our Annual Reports, of which a large number are printed and distributed, giving illustrations of the butterfly, caterpillar and chrysalis, and with a series of questions, carefully prepared to elicit information upon all the doubtful points in its life history. That the observers be requested to pin up the leaflet in a convenient place, and fill in their observations as soon as made, and then at the close of the season, when the last of these butterflies have disappeared, to sign and forward them to Dr. Fletcher, to whom they would go post free, and the results could then be tabulated by a committee of the Society.

In order to insure a general interest in the matter, it would be well for the Society, or individual members, to offer a series of say five prizes, ranging from \$10.00 to \$2.00 for the best and most complete reports sent in.

THE INSECTS OF THE SEASON.

BY W. LOCHHEAD, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

The year 1902 was one of many surprises for the economic entomologist. Several insects which did serious damage in 1901, and which gave indications that their ravages would be even more serious in 1902, were conspicuous by their absence, or by their very diminished numbers. The Hessian Fly is an example. Again, other insects, which in the last few years were not considered serious, appeared in large numbers and did much damage. The Clover-seed Midge is an example. Other examples will be given in their appropriate place in the following notes.

The wet, cold season had its influence in checking the multiplication of some injurious forms, but in the case of others there was no appreciable check.

INSECTS INJURIOUS TO FARM CROPS.

For reasons, which can be only partially explained, the Hessian Fly (*Cecidomyia destructor*) did very little damage in those regions where it was most abundant last year. While it is true that a much smaller acreage of wheat was sown last fall, and as a rule the sowing was done much later than usual, yet there remains some apparently unaccountable cause for the almost total absence of flies in those regions. The winter and fall were not unfavorable to insect life, if we can judge from the condition of most insects in spring. It is probable that the parasites were more abundant than were supposed, and that they were instrumental largely in killing most of the Hessian Flies.

In South Grey, however, the Hessian Fly did much damage this year, some fields of wheat being entirely broken down by the spring brood. There it appeared to attack certain varieties of wheat in preference to others. For example, the Early Arcadian was untouched, while the early Clawson, sown at the same time, and on the same kind of soil, and under other similar conditions, was seriously affected.

The Pea-Weevil (*Bruchus pisi*) continued its ravages with undiminished vigour in the older sections, and spread to new areas where it had previously been unknown. It is evident that concerted action must be taken or else pea-growing will have to be abandoned. Already in some sections the latter policy has been adopted.

The Clover-seed Midge (*Cecidomyia leguminicola*) Figs. 39, 40 and 41, was abundant in the western portion of Ontario, and in many places completely destroyed all clover left for seed. Even that which was pastured up to June 20th was destroyed, according to some reports. Here, again, farmers must co-operate. All should cut or pasture their clover until the 20th of June.

In many respects, *Wireworms*, Figs. 42 and 43, may be considered one of the most injurious insects which attack farm crops. The extent of the ravages is difficult to compute, for in some localities they are almost absent, but in others they are very abundant.

On account of their habit of working below the surface of the ground, no reliable method has been devised for their destruction, or for the prevention of their attacks. In fields which have been kept for several years in sod, wireworms are almost certain to multiply. When the sod lands are broken up, the "worms" will be found in almost every stage of development. Some are very young and will require two or more years before becoming mature; some are a year old; some two years old,

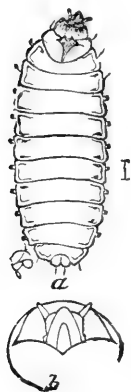


Fig. 39.

The Clover-seed Midge: (a) larva highly magnified; (b) head retracted, still more highly magnified. (Riley.)

and others nearly mature and perhaps entering the pupa stage. It is evident then that the breaking up of the land will destroy but a small number of all the wireworms in the soil. If the ploughing is done in the fall, and the land is kept well stirred until winter sets in, many pupae will be destroyed; but the grubs will be but slightly injured. The roots of the grasses turned under may satisfy their appetite the following season, and the crops may not suffer much. In the second season, however, these supplies of food are exhausted, and the roots of the growing crops are called into requisition. Hence the common complaint that wireworms are often more destructive the second season after the sod is ploughed under. It behoves the farmer, therefore, to put in a crop which is specially immune, such as peas, or a hoed crop.

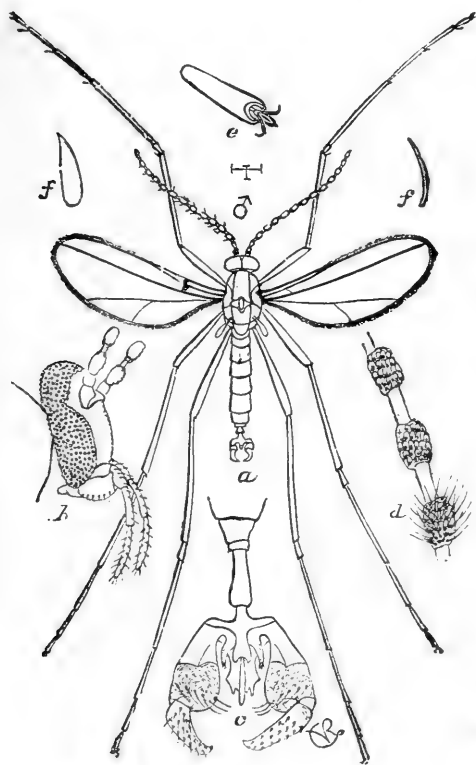


Fig. 40.

(a) The Male Midge, highly magnified; (b) head, further enlarged; (c) clasper organs; (d) joints of antennae; (e) claws; (f, f') forms of scales on body and wings. (Riley.)

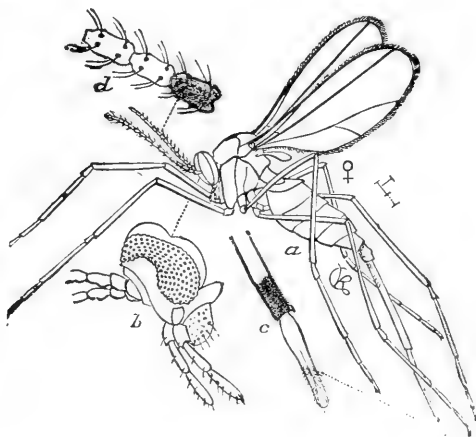


Fig. 41.

(a) The Female Midge, with her four-pointed ovipositor extended; (b) head; (c) tip of ovipositor; (d) joints of antennae; all highly magnified. (Riley.)

Fig. 42.
Wireworms.Fig. 43.
Click-beetle
parent of
Wireworms

The main preventive is a short rotation of crops, in which the fields are not allowed to remain longer than two seasons in grass.

Experiments and experience have both shown that there is no use attempting to kill the wire-worms by soaking the seeds in poisonous chemicals, or by putting poisonous substances on the lands in the hope that the insects will be killed.

Cutworms were quite abundant in many sections of the Province, and did considerable damage.

An interesting observation was made in Kent County where the cutworms were very numerous up to the end of May. Heavy rains occurred at this time, and many of the low level fields were inundated. Thousands of dead cutworms were seen along the borders of the drowned fields.

INSECTS INJURIOUS TO VEGETABLE AND GARDEN CROPS.

The *Colorado Potato Beetle* (*Doryphora decem-lineata*) was not as injurious as in former years. It is probable that the wet season was responsible for the diminution in numbers.

The *Squash Bug* (*Anasa tristis*) Fig. 30, was also not so troublesome as in previous years; but the *Cucumber-Beetles* held their own and did much harm.

Blister Beetles were not so abundant as usual, probably due to the fact that *Grasshoppers* have not been numerous for the past two or three seasons.

Cutworms were reported from North Grey as cutting off young mangolds and cabbages.

The *Turnip Aphis* (*Aphis brassicae*) did little damage and was not noted in any reports which I received, but the *Cabbage-worm* (*Pieris rapae*) was quite destructive not only on turnips but also on cabbages and cauliflowers.

The *Zebra Caterpillar* (*Mamestra picta*) was quite common in most turnip and cabbage fields. (See Fig. 21.)

At Leamington in Essex County, the *Melon Plant Louse* (*Aphis cucumeris*) was very abundant in many of the large melon fields. They were kept in check by a careful application of tobacco solution. These insects are greenish-black, and infest the under surface of the leaves; consequently, the tobacco applications must be made to the under surfaces by means of an elbow on the rod near the nozzle.

Asparagus beetles were not so destructive this year as usual about St. Catharines.

The *Tomato and Potato Flea-beetles* (*Epitrix cucumeris*) were very abundant. It is of interest, economically, to note the relation of these flea-beetles to the *Early Potato Blight*, which was prevalent this past season. The edge of the holes eaten by the beetles soon became diseased, and examination showed the presence of spores of the *Early Blight* (*Macrosporium solani*). It is probable that the beetles are carriers of the disease from one leaf to another, and it is more than probable that the dead tissue surrounding the holes made by the beetles forms a suitable medium for the establishment of this semi-saprophytic fungus.

Early applications of Bordeaux and Paris Green are necessary for the control of the beetles as well as the fungus.

The *Potato Stalk-Borer* (*Trichobaris 3-notata*) Fig. 44, which committed such serious ravages in Pelee Island last year, appeared again this year, but in diminished numbers.

Many potato-growers on the Island suffered greatly, but definite information as to the real extent of the injury done is wanting on account of the more serious damage done by the *Late Potato Blight* (*Phytophthora infestans*). The death of the stalk by the fungus may aid in killing the stalk-borer, since the larvæ may be prevented from reaching maturity. It is the duty of the potato-growers, however, to take the usual precautionary measures, viz., to burn the vines in the field in the fall, so as to kill the surviving adult

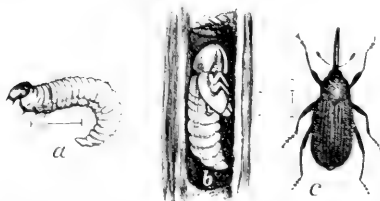


Fig. 44.—Potato Stalk-borer: a. grub; b. pupa; c. beetle, all much magnified.

beetles, which would otherwise hibernate in the dead stalks.

INSECTS INJURIOUS TO ORCHARD TREES.

In spite of the unfavorable wet season, the San José scale increased in large numbers in the infested sections. The pernicious nature of the scale is now impressing itself strongly on the minds of the fruit-growers, and they are coming to the conclusion that the warnings of the entomologists, uttered seven or eight years ago, were warnings which should have been heeded then, and not now. The orchard men themselves must now bear the burden of controlling the

scale. Their task is far from being a hopeless one, however. Experience shows that there are several insecticides which may be used with good results. These are whale-oil soap, crude petroleum, and the lime and sulphur mixture. The last is by far the cheapest remedy, but the great objection to its general adoption is the difficulty of preparation. Two pounds of lime are boiled with one pound of sulphur in a kettle for two hours. Much requires to be known concerning the chemistry of the resulting mixture, for different sulphides of calcium are formed according to the time the mixture is boiled. It is probable that some one of these sulphides is more effective than the others.

The example of Saltfleet Township is to be commended when it passed a by-law whereby inspectors were appointed to make a careful examination of the orchards for San José scale, in view of preventing its spread. It is to be hoped that other municipalities will follow the example set by Saltfleet, so that a limit may be placed to the spread of the scale.

The Codling Moth (*Carpocapsa pomonella*), so far as my own observations extend, was not so injurious this year as last. The first brood appeared rather late, but the second brood was quite numerous. The wet season precluded careful spraying operations which may account for the large second brood.

A correspondent from South Grey reports that the Codling Moth was very injurious. He says: "It would not be exaggerating to say that one-third of the apple crop was destroyed by this pest."

In my last year's Notes on the Injurious Insects of the Year, I called attention to the worthlessness of the Haseltine Moth Trap-lantern.

Recently another device for entrapping the Codling worms has been put on the market. It is known as the Expansive Tree Protector. It consists essentially of an expansive metallic collar, coated on its underside with a sticky substance, and a cloth band saturated with a poisonous liquid placed between the collar and the trunk of the tree. Although not in a position personally to test the device this year, I had an opportunity of inspecting many of them in different orchards. In nearly every case they failed to give satisfaction, and in some instances were positively harmful. In the first place, they are difficult to fit to the trunk of the tree; secondly, the sticky substance did not hold the caterpillars, and other forms of insect-life, or prevent them from crawling over it; thirdly, the poisonous band did not kill the insects which crawled beneath the collar; and fourthly, the bark of the tree immediately beneath the band was frequently seriously injured.

In my humble opinion, decided improvements in the construction of this device must be made before it becomes effective.

In Prince Edward County the Apple Maggot (*Trypeta pomonella*) was abundant. In some orchards more than half the fruit was injured by this maggot.

The work of this insect differs from that of the Codling-worm in that channels are eaten through the fruit in every direction. Spraying is of no value in combating this pest, and the remedy is one of prevention. The infested fallen fruit should be destroyed at once, so as to prevent the maturing of the flies. When the maggot is full grown it leaves the apple, and pupates on, or just below the surface of the ground.



Fig. 45. Peach-tree borer, female moth; 2 male moth.

Peach-tree Borers (*Sannina exilis*) Fig. 45, were very numerous, especially in the Niagara district. Many young trees of this year's planting were injured.

The Plum Curculio (*Conotrachelus nenuphar*) was abundant in most sections of the Province.

The Bud-moth (*Tmetocera ocellana*) Fig. 46, and the Cigar-case Borer (*Coleophora Fletcherella*) were serious pests in many orchards the past season, and it is my opinion that the latter is becoming more injurious with each succeeding year. Last spring I saw an orchard in which every tree was badly infested. In some instances, the wintering cases literally covered portions of some of the smaller branches. It is true that the orchard referred to was a neglected one, so far as insects and fungi are concerned, but it is also true that both the Cigar-case Bearer and the Bud-moth are difficult to treat successfully. Both insects are well protected by their coverings, and experience shows that thoroughly careful spraying at the right time is required to kill them. Fortunately for the orchardist, both begin active work about the same time, hence both can be treated at the same time.



Fig. 46. Bud-moth and larva.

I feel that more demonstration spraying in the infested orchards is necessary before the fruit-growers will be convinced that these insects can be treated successfully. Seven or eight years ago it was shown that two or three applications of Paris green (4 ounces to the barrel) as soon as the cases became active in the spring, would hold the Case-bearers under control. Also, that kerosene emulsion, diluted with nine parts of water, applied at the same time was quite effective.

Aphids were unusually abundant in many orchards.

INSECTS INJURIOUS TO SHADE TREES.

The protection of shade trees from the attacks of boring insects is becoming quite a serious problem in many of our towns and cities. It is becoming apparent that greater watchfulness is required. The watchman, however, should have some acquaintance with the habits of the insects to be watched, so that remedies may be taken at the right time. One of the duties of the watchman, however, should be the protection of our insectivorous birds, for we must rely to a great extent upon them for the destruction of the borers. The increase in number of borers in recent years, I think, can be traced to the wanton destruction of so many of our useful birds, and their protection at the present time is imperatively demanded.

A shade tree pest, new to me, has arrived within the last two or three years. The birches are the victims in this instance. I have watched their work in Guelph for two summers. I thought at first that the birches were dying from the physiological causes which produce *Stag-Head*, but I was wrong in my diagnosis. My attention was called this summer to dying birches in Hamilton, where an examination of the dead limbs revealed the presence of a borer. I was unable to get specimens of the adult, but the owner of the trees stated that he saw many of them in early summer. On account of their small size and their active habits, he was unable to make any captures.

From a study of their work, I was able to identify them as the Bronzy-birch Beetle (*Agrius anxius*), one of the Buprestidae. This borer has been found working in London, Buffalo, Detroit, Ann Arbor and Chicago.

It would appear that the beetles begin work at the top and work downwards. For this reason, the tree begins to die first at the top. The burrows made by the grubs are very irregular, and have no definite direction. In most limbs which I examined I could trace their labyrinthine, net-work courses for considerable distance in the cortex and young wood, but often they would run directly into the wood, and emerge again at the surface. In one case, I found a straight tunnel in the heart-wood, but this occurred in a small twig not more than one-third of an inch in diameter.

The exit hole of the mature beetle is characteristic, I think. One side is straight, and the other is curved to conform to the shape of the beetle.

The effect of all this burrowing of many grubs in infested trees is to weaken the branches and to interrupt the supply of food and food-materials to the parts above. Some of the trees which were examined in Guelph and Hamilton, had their bark from top to bottom perforated with holes. Many of the larger limbs had raised ridges on the bark, which, when cut open, showed burrows beneath.

The life-history of this insect is about as follows: The adults emerge in May, and begin laying their eggs in crevices on the bark. The larvae hatch in June, and are not full grown when winter sets in. They remain torpid during the winter, and become full grown in April or early May. The pupa stage is of short duration, for the adults begin emerging in May, as already stated.

It is impossible at this stage in the study of the insect to indicate a definite line of remedial treatment. As the beetles are capable of flight, it is necessary that dying and dead trees should be cut down before the escape of the beetles in May to prevent the infection of neighboring healthy birches. Their natural enemies are unknown to me, with the exception of the woodpecker, which I have seen frequently on affected trees. It is likely that we will rely upon this bird to help us in controlling this new pest of the birch.

THE PAPER-MAKING WASPS OF THE PROVINCE OF QUEBEC.

BY REV. THOMAS W. FYLES, D.C.L., F.L.S., LEVIS, QUEBEC.

Once upon a time, I was taken over a pulp-factory, and shown how billets of wood were converted into paper. The process seemed to me a natural outgrowth from one that I had witnessed, when a boy, among the descendants of Huguenots who settled at Dartford in Kent two hundred years ago. These men, in their little workshops, manufactured paper from cotton rags.

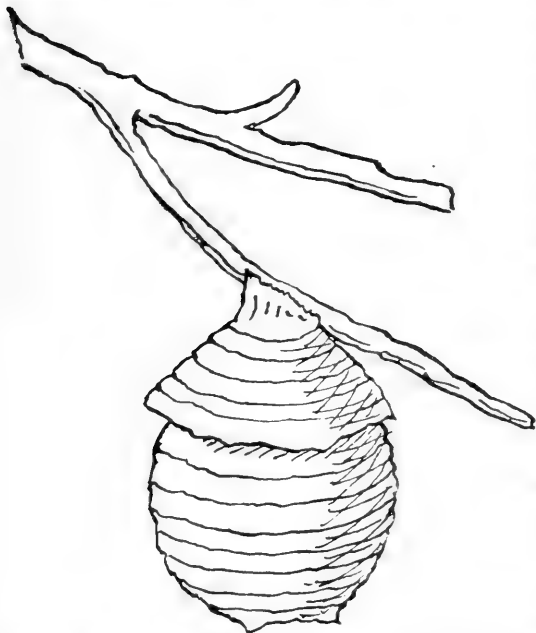


Fig. 47. Wasp's nest at an early stage of construction (original). wonderful structure, suggestive of a variety of things,—tents, umbrellas, capes, the papier-maché dwellings of the Japanese, compressed woodenware, etc.

It is often of great size. The Rev. J. B. Debbage of Bourg Louis has one that measures round it, over top and bottom three feet two and three-quarter inches and, when taken round the middle, two feet nine and a half inches.

The fineness and tenacity of vegetable fibre have been ever since the creation; and paper-makers (not always human) have existed, in successive generations, through all the ages since that great event.

"The thing that hath been is that that shall be, and that which is done is that which shall be done; and there is no new thing under the sun."

"Is there anything whereof it may be said, this is new? It hath been already of old time which was before us."—Ecc. I. 9-10.

The nest of the Black Hornet (*Vespa maculata*, Fabricius) Figs. 47 and 48, is a

Our fences and out-buildings supply abundance of material for the busy workers that construct such dwellings. In the wilderness they resort to trees rent by tempests, etc., for their supplies.

The old church at Hull, Province of Quebec, was built of wood. It had never been painted. One summer day, about thirty-seven years ago, when on a visit to Hull, I walked up to see the church. It stood on a rocky knoll and was surrounded by cedars—the French part of the town now covers the spot.

I thought to look in at the windows, but these were high up; and I did not venture to climb, for busily employed about the building were hundreds of wasps, of different kinds. They were eroding the surface of the wood with their jaws—procuring the materials for the construction of their nests.

The material thus procured would be thoroughly masticated and mixed with a natural fluid or saliva, till it was of the right consistency. The wasps, on commencing their work, would deposit the prepared material and then bring it into shape with their mandibles, going over it again and again, pinching it till it was of a proper thinness.

The comb in the hornet's nest is very different from that in a hive of bees (Fig. 48). The bee's comb is of wax; the hornet's of paper. The bee's comb is suspended in masses perpendicularly—the cells, two deep, being placed back to back and opening sideways. The hornet's comb is suspended in tiers horizontally, the topmost tier hanging by a stalk to the roof, and each of the others by a stalk affixed to the centre of the one above it. The cells are only one deep in each layer, and open below. In the beehive some of the cells are filled with honey and some contain young bees. In the hornet's nest all the comb is brood comb, the young being fed with nutriment prepared by the mandibles and maxillæ of their attendants. (Fig. 49).

The larvæ of the hornet, in their early days, are held in place by a glutinous fluid, and later, by pressure upon the sides of their cells. When they are about to change to pupæ, they spin a web over the entrance of their cells and close themselves in.

Mr S. Stone, in the *Entomologist's Weekly Intelligencer* for June 11th, 1859, (No. 141, page 84) thus described the process of feeding the larvæ in a wasp's nest:

"The process is an extremely interesting one. An attendant or nurse on retiring from a foraging excursion with a caterpillar it has found on a neighbouring hedge: a piece of meat neatly rolled

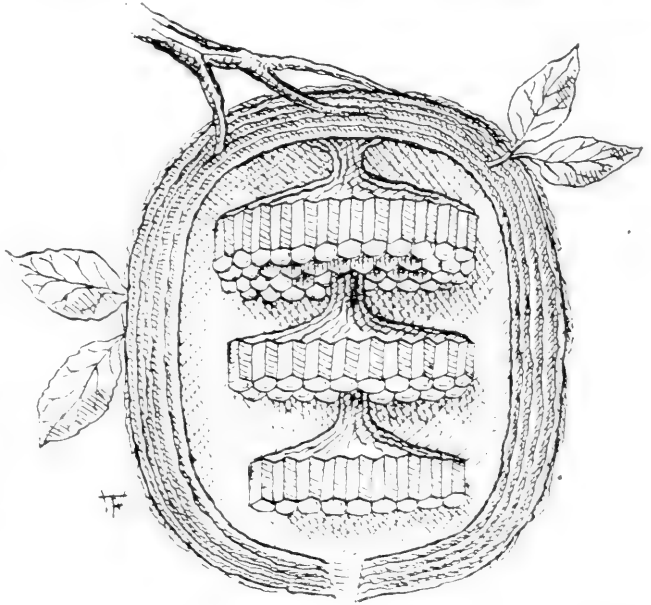


Fig. 48. Section of Hornet's nest (original).

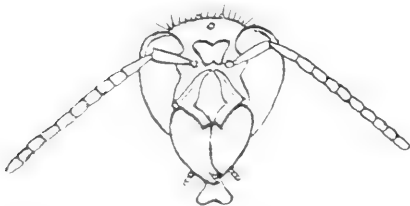


Fig. 49. Head of Wasp, showing mouth parts (original).

up, that it had purloined from a butcher's shop or somebody's larder; a specimen of the insect popularly known as 'daddy-long-legs,' shorn of its wings and other encumbrances, especially if the day be a windy one, for the purpose of lessening the difficulty of conveying such an unwieldy creature through a disturbed atmosphere—for wasps have powers as nearly as possible allied to reasoning ones, as has been observed upon other occasions as well as the one recorded above; or perchance a winged ant caught in the act of migration, is met at the entrance to the nest by one, two, and sometimes three other attendants. These at once lend their aid in cutting up the 'prey,' which they not only reduce to the consistency of pulp by mastication, but to all appearance actually swallow. Having done this they separate, and taking different courses, commence feeding the larvæ which lie in their route. As they pass over a cell, the larva therein contained, if hungry, protrudes its head and applies its mouth to that of the attendant, who stops for a few seconds for the purpose of allowing it to sip its fill. This done, the latter moves on to another cell, where the process is repeated. If on the approach of the attendant a larva does not require food, instead of protruding its head it remains quiet, when the former passes on to another cell where its services may be required. In this way an attendant will feed perhaps twenty larvæ before the contents of its stomach, or whatever else may have served as a receptacle for the food it has been dispensing, is exhausted, when it again proceeds in quest of food, either leaving the nest to obtain it, or else taking part, in the manner already described, with one which has just returned from foraging."

It will be observed from the above account that the wasps feed their charges much as the dove feeds her young, by supplying them with partly digested food from its own crop.

Mr. Stone's observations upon the feeding of the wasp-larvæ confirm those made by Mr. Spence as recorded in Letter XI, Kirby and Spence's *Entomology*, and by Willoughby and Réaumur before him.

Vespa Germanica, Fabricius—like the European *Vespa vulgaris*, Linneus—makes its nest in a chamber in the ground, taking advantage of some natural hollow, or enlarging the run of some small animal. I found such a nest by the roadside on the Island of Orleans last summer.

Some years ago I took a nest of *Vespa media*, Olivier. I found it suspended from the ceiling of a coach-house belonging to my highly-esteemed friend, the late I. J. Gibb, Esq., of Como, P. Que. This nest was compact and smooth, and of the size of a cricket-ball. The entrance was in the middle of the under side, and was about half-an-inch in diameter.

The late P. H. Gosse in the *Canadian Naturalist*, page 269 describes the nest of *Vespa marginata*, Kirby. He says:—

"That is not a stone, although it looks so much like one, as you would find to your cost if you planted your foot on it. The mowers have cut as near as they durst approach to it, for it is a wasp's nest (*Vespa marginata*) and full of very irascible and formidable subjects, who are not to be assaulted with impunity. These large round nests are generally attached to a stone, often nearly covering it, and cannot easily be distinguished from it. They are made of a tough whitish paper, manufactured by the wasp, of the minute particles which she abrades from weather-beaten wood, and agglutinates with saliva, spread out into this form. This nest consists of several layers, convex above, and projecting at the edges to shoot off the rain from the comb within, which is made of the same substance, and contains young and pupæ. You may observe numbers of the wasps coming and going, and crawling busily about the nest, the entrance to which is beneath the edge."

Vespa marginata, Kirby = *Vespa consobrina*, Saussure = *Vespa arenaria*, Fabricius. See Cresson's HYMENOPTERA, page 290.

I found a nest of this species last season in the open woods near Fort Number 2, Levis. It was close to the ground, and was supported by some small stems of brush wood. I went one cold day in October to obtain it, but somebody had forestalled me.

Among the bees there are large females, small females or workers, and males or *drones*; so is it among the wasps; and the male wasps are stingless as the *drones* are. They may be distinguished from the females in this way:—

The male wasps have 13 joints in the antennæ.

The female wasps have only 12.

The male wasps have 7 abdominal segments.

The female wasps have only 6.

Bees, wasps and ants have the three kinds,—males, females and workers. It is customary amongst naturalists to distinguish these by the astronomical signs for Mars, Venus and Mercury. The sign of Mars is a shield and spear ♂. That of Venus is an apple with its stalk ♀—in reference to the golden apple awarded to her, as the most beautiful of the three goddesses (*Juno*, *Minerva* and *Venus*), by Paris. That of Mercury, the *caduceus*, or staff with serpents intertwined ☿.

Hornets and wasps are not troublesome unless they are molested. They destroy vast numbers of flies and destructive larvæ, spiders, etc. But, strange to say, the wasps themselves fall victims to predacious flies (*Asilidæ*) which know how to pounce down upon them, and seize them, just so that they can neither use their jaws nor their stings.

The following is a table of the Quebec Paper-making Wasps:—

Family VESPIDÆ.

Genus *Vespa*, Linneus.

1. The Black Hornet, *Vespa maculata*, Fabricius.
2. The Margined Wasp, *Vespa arenaria*, Fabricius.
3. The German Wasp, *Vespa Germanica*, Fabricius.
4. The Diabolic Wasp, *Vespa diabolica*, Saussure.
5. Fernald's Wasp, *Vespa Fernaldi*, Lewis.
6. The Scalloped Wasp, *Vespa media*, Olivier.
7. The Red Wasp, *Vespa rufa*, Linneus.
8. The Common Wasp, *Vespa communis*, Saussure.
9. The Northern Wasp, *Vespa borealis*, Kirby.

Genus *Polistes*, Latreille.

1. The White-footed Polistes, *Polistes pallipes*, Lepell.

NOTES.

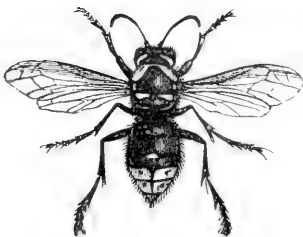


Fig. 50.—*Vespa Maculata*, the Black Hornet.

1. The Black Hornet (Fig. 50), is so named to distinguish it from the Yellow Hornet of Europe (*Vespa crabro*, Linneus). It is the largest and most formidable of our wasps. It is common and well-known.

2. *Vespa arenaria*, is known to the French Canadians by the term "Guêpe cousine." It is a handsome black wasp with narrow, white or yellow margins to the abdominal segments.

3. *Vespa Germanica* is a beautiful little wasp, and has much yellow about it. It may be easily recognized by the yellow bands on the first segment of the abdomen which form a

loop, and enclose a triangular patch of black.

4. The female of the Diabolic Wasp is about six-tenths of an inch long. It is black with long yellow hairs. It has much yellow on the abdomen. Upon the first segment, the yellow

is narrow and interrupted. Upon the others, it is indented by the black, in the middle, and on either side of the indentation is a black dot. Saussure must surely have been severely stung by this wasp when he gave it its formidable name.

5. *Vespa Fernaldi* was identified for me in the Entomological Division of the Department of Agriculture, Washington. It is a pretty insect. In each of the abdominal segments the black intrudes upon the yellow by three indentations, of which the apical one is the largest.

6. In *Vespa media* all the segments of the abdomen are marked alike with three scallops protruding from the black band of every segment. The workers especially of this species have much brown hair about them.

7. *Vespa rufa*. Last summer I took a perfect female specimen of this beautiful and rare wasp. It was flying under the veranda of Mr. Morgan's country-house on the Island of Orleans. The insect is three-quarters of an inch long, and an inch and a quarter in expanse of wings. The antennæ was black without spots. The eyes are black and have an outer streak of white on the upper off side only. Between the antennæ is a white patch, indented above and below, and broader than deep. The white facial plate is angulated outwardly, and is divided, through all its length, by a broad black patch somewhat narrowed towards the bottom. The legs of the insect are pale yellow above and red underneath. The marks on the thorax are white. The segments of the abdomen are bordered with creamy white. The wings are somewhat smoky, but have an ochreous tinge, and the veins are sienna-coloured. The first abdominal segment of this wasp is of a rich chestnut or venetian red; and on the second segment there is an interrupted patch on either side of the same colour. This segment is, with the exception of the border, wholly dark red on the under side. The tip of the last segment is red. The wasp is strikingly handsome. In the Provancher collection there is a worker of this species taken at Chicoutimi.

8. *Vespa communis* also was identified for me at Washington. It, more than any other of our Quebec wasps, resembles the *Vespa vulgaris* of Europe. I have taken it at Cowansville and at Quebec.

9. *Vespa borealis*. The wasp is described in Kirby's "Fauna Boreali-Americana: Insecta" page 265. The description may be found on page 129 of Dr. Bethune's useful compilation from Kirby's work, which was published by the Entomological Society of Ontario some years ago. Kirby states that the specimen he described was taken as far north as lat. 65°. A male specimen of this species that I took at Levis last summer has been identified for me by Mr. Ashmead of Washington.

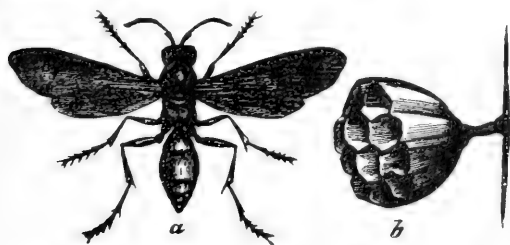


Fig. 51.—*Polistes pallipes*; a. the wasp; b. portion of comb.

Polistes pallipes may be easily known from its slender and elegant form, its soft brown colouring, its white feet, and the two parallel longitudinal streaks on the after part of its thorax. (Fig. 51.)

I will now close my paper with a story told me by Mr. H. Brainerd of Montreal. It tells of an entirely effective, but somewhat costly method of getting rid of a wasp's nest.

The Hamilton Powder Company had a magazine at Dinorwic, Ontario. In it was stored four tons of dynamite. One day in last September two Irishmen were sent by the Hudson Bay Company, to take out a supply of the explosive. There was a wasps' nest under the eaves of the building, and an irritated wasp stung one of the men. He "got mad," and vowed he would "smoke the critters out," so he made a "smudge." Now the ground had become saturated with nitro-glycerine, and no sooner was a light applied to the smudge, than an

ominous flash alarmed the men, and they took to their heels. They had gone but a short distance when there was a fearful explosion and they were struck down senseless. On their recovery they told how the affair had happened.

The loss was—the building ; the dynamite, worth about \$1,200 ; charges for broken glass, \$140 ; and a smashed canoe ; *but no trace of the wasps' nest could be found.*

SOME INTERESTING HABITS OF LEPIDOPTEROUS LARVÆ.

BY ARTHUR GIBSON, OTTAWA.*

The student of insects is continually being astonished and mystified by the wonderful things which are ever occurring in the entomological division of the animal kingdom. No matter what kind of insect study one may enter upon, nature never fails to present a varied, at times incomprehensible, series of interesting objects. In the lepidoptera there is no exception to the rule. While mysteries will continue to be, at the same time, owing to the rapidity with which the science is now developing, many of the facts which are, as yet, unexplainable, will doubtless in the near future be expounded, and knowledge which we are now badly in need of, be duly placed at our disposal. A study of the larvæ of our butterflies and moths will soon convince the student that there is much of interest as regards even the habits of the commonest species, many of which show remarkable traits.

As the title given this paper covers a wide field it is only the writer's intention to mention, in a general way, some of the interesting habits which have come under his notice. When asked for a short paper it occurred to me that if I could put together a few facts concerning the habits of some of these larvæ, my endeavor might not be without interest.

At the outset a short mention will be made of the feeding habits of these creatures. All have doubtless seen some caterpillars feeding, and know that the particular habits of each kind vary to a great extent, almost every species showing some peculiarity. While some caterpillars are extremely restricted in their choice of food, only feeding on one or two plants, others are quite indifferent and will eat almost anything, some species having been known to eat up everything in sight. A good common example of the former class is the Monarch Butterfly, *Danaus archippus*, Fab., the larvæ of which are known to feed only on *Asclepias*, while in illustration of those which are general feeders, the Variegated Cutworm, *Peridroma saucia*, Hbn., might be cited. During July and August, 1900, the caterpillars of this species fairly swarmed in the Province of British Columbia and the States of Oregon and Washington, devouring plants of all kinds and causing a loss to grown crops of \$168,000 in British Columbia alone, from which it has been estimated that a loss of \$2,500,000 accrued in that year in the United States and Canada.

From an economic point of view an understanding of the feeding habits of larvæ is important. It is well known that if the grower of any marketable crop desires to obtain the fullest returns, a knowledge of his insect enemies will materially aid him, when his fruit trees, cereals, etc., are attacked by any of these pests. While some caterpillars are general feeders, most species, however, are particular in their choice of food. In the event of a certain caterpillar occurring in large numbers upon any single kind of fruit tree, or crop, anxiety or loss and unnecessary work may be prevented if it be known to the producer that the species only feeds on the plants upon which it is first found, or those botanically related, and that it is not likely to spread to adjoining crops. Of course there are instances of certain caterpillars doing damage to plants upon which they were not previously known to feed, but such occurrences are unusual. Cutworms, for instance, which are the caterpillars of the Agrotid moths, as a

* Read before the Toronto Branch of the Entomological Society of Ontario.

rule only feed at night, generally confining their attacks to low plants, such as cabbages, cauliflowers, etc., so during serious outbreaks apprehension as to danger to near-by trees, or other crops, may, in many instances, be avoided.

Some species of larvæ have the habit of lying close together in serried ranks when feeding, and many of congregating when resting.

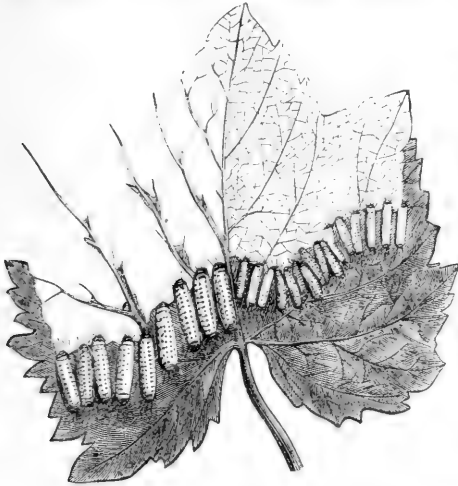


Fig. 52. *Procris Americana* larvæ feeding.

Interesting examples of the former kind are *Procris Americana*, Harris, Fig. 52, *Attacus promethea*, Dru., and *Hyperchiria io*, Fab., which, when in their younger stages, feed in a row, each larva beside the other, on the underside of a leaf. *Vanessa antiopa*, Linn., and the *Datanas* are examples of those which feed in colonies, a small branch having as many as fifty or more, close together, while on the remainder of the tree there may not be a single specimen. The two kinds of Tent Caterpillars furnish splendid examples of larvæ which congregate in masses when not feeding. Everyone has seen the tents of *Clisiocampa Americana*, Harr., the true tent caterpillar, containing large numbers of the larvæ, and most people have doubtless seen the large masses of the Forest Tent caterpillar, *Clisiocampa disstria*, Hbn., which does not make a tent, the larvæ when at rest congregating on a silken mat spun on the trunk of a tree or along one or two of the branches.

While many species of caterpillars have the habit of congregating in numbers, others are quite the opposite, and are solitary throughout the whole of their larval existence, not more than one, or at most two, specimens being found feeding on a single plant. A common interesting illustration of this is *Arrama obliquata*, G. & R. The larva of this species is a borer, feeding inside the main stem of the common Cat-tail, *Typha latifolia*, L., inside of which it also generally passes the pupal state. Specimens, however, when mature sometimes leave the Cat-tail and wander, or swim, to the shore or edge of the swamp to seek a suitable place to pupate,—under a rock, piece of fallen branch, or in an old stump under the bark or in the rotten wood. I have collected hundreds of specimens of this caterpillar in various localities and only rarely have found two specimens in the same plant. These larvæ when full grown measure nearly two and one-half inches long, and not possessing any attractive qualifications can hardly be termed beautiful caterpillars. Mr. Henry Bird, who has done such good work in *Hydroecia*, relates the interesting habit of *Hydroecia duvata*, one of his new species. In a letter to Dr. Fletcher he says that “thousands of plants (*Solidago sempervirens*, L.) may be examined without any sign of a borer. A dozen isolated ones in another neglected spot may contain twenty-four larvæ, not twenty-three, or twenty-five, but the two dozen to a nicety, for Mrs. Duovata can count up to two without any failure when depositing her ova.” Among the butterfly larvæ those of *Pamphila metacomet*, Harr., and some other skippers, which Dr. Fletcher has specially studied, are solitary in habit. These caterpillars feed on various species of *Carex* and curiously enough furnish themselves with a cocoon-like structure, in which they live when not feeding. This interesting contrivance is placed between two of the larger leaves which are drawn together and fastened by means of silk. This habit of course provides great protection to the caterpillar, as it is only by separating almost everyone of the central leaves of a plant that their home can be found. It is altogether unlikely that many have seen these caterpillars in nature, as they require to be looked for very closely.

During the past two summers the foliage of birch trees of all kinds, was badly attacked by the larvæ of *Bucculatrix Canadensisella*, Cham. These small caterpillars occurred in vast numbers throughout Ontario, but were not noticed by the public until late in August when the trees assumed a seared appearance, and the leaves were dropping prematurely. These larvæ are popularly known as the Birch Skeletonizer, from the way they eat away the cellular tissue of the foliage, leaving only the fibrous skeleton, and are of considerable interest from the peculiar habit they have, which is quite unusual, of spinning on the leaves, before full grown, flat circular shelters, called pseudo-cocoons, whenever they are ready to moult. These little shelters, which of course are only large enough to contain the one larva, are only used by the caterpillars about a day or so before the process of casting their skin.

An interesting example of a caterpillar illustrating protective mimicry was observed last season by Dr. Fletcher and the writer. In May, 1901, larvæ of one of the noctuid moths, *Homohadena badistriga*, Grt., were found in some numbers on the yellow-flowered honeysuckle, *Lonicera hirsuta*, Eaton. Caterpillars in all stages were found, but strange to say no trace of eggs could be seen. Very small larvæ were collected about a quarter of an inch long, which must have been out of the egg only a day or so. Doubtless, as is often the case, the young caterpillar made its first meal of the shell from which it had emerged. It is probable that some eggs were still on the plant, but although searched for diligently, none could be discovered. When young the caterpillars feed on the foliage of the new shoots of the plant and generally hide inside the two clasping leaves which surround the cluster of flower buds at the tip. When mature they crawl down to the shady side of the old wood of the plant, upon which they rest when not feeding. At this time the general colour of the caterpillar is remarkably like that of the stem, or twig, upon which it is resting, and owing to this striking resemblance, it is thus protected from numerous enemies.

Many other larvæ owing to their colour being similar to that of the plant upon which they feed are likewise hidden from view, and unless searched for carefully, even when they are known to be present, are difficult to find. *Plusia ereoides*, Grt., which feeds on *Solidago Canadensis*, L., is another example of a corresponding similarity in coloration of the caterpillar to the green colour of the leaves and stem, protecting the species from natural enemies, such as birds, parasites, etc.

The larva of *Nerice bidentata*, Walk., feeds on the foliage of elm; it is a rather curious caterpillar with sharp protuberances down the dorsum. This species feeds on the edge of a leaf, and owing to its colour being the same as that of the foliage, and its peculiar elevations on the dorsum corresponding with the outline of the leaf, it is thus protected considerably from being observed. A similar example of protective resemblance is found in the caterpillar of *Telea polyphemus*, Cram., which when feeding on the edge of an elm leaf from which it has eaten out a portion, is even better protected than the above by reason of its indented dorsal outline and the bright lateral stripes, which simulate the ribs of the leaf.

An interesting habit which certain of the Coliad larvæ have, is that of resting exactly in the same place, after feeding, along the mid rib of a leaf. When wandering off to feed they spin a path of fine silk as they walk. After they have eaten their meal they are thus able to

return by following this silken road to the exact spot from which they first started. *Papilio turnus*, Linn., also has the habit of spinning a platform of silk across the upper side of a leaf upon which it rests when not feeding. (Fig. 53).

Doubtless every collector of insects, or student of natural history, has noticed the habit

which many caterpillars have of drawing two or more leaves together by means of threads of

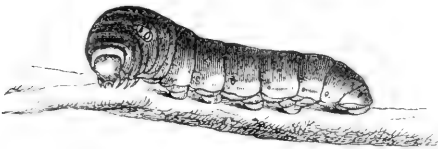


Fig. 53. Larva of *Papilio turnus*.

silk, in which they feed, or in which they rest when not feeding. Some larvae curl up a single leaf, fastening the sides with silk, and live inside the enclosure thus made until they have eaten nearly the whole leaf, when they go to another leaf, and so on until they reach maturity. The caterpillars of some of our common butterflies, such as *Vanessa Milbertii*, Gdt., *Pyrameis cardui*, Linn., etc., have this habit. The larvae of the large skipper *Eudamus tityrus*, Fabr., which feed on the Locust-tree, *Robinia Pseudacacia*, L., and *Nisoniades lucilius*, Lint., on *Aquilegias* also live inside tents, which they make by drawing down a leaf to serve as a cover fastening the same to another leaf immediately under. One end of the leafy case is left open to enable the caterpillar to get out to feed.

Phlyctaenia ferrugalis, Hbn., which is an interesting species on account of its economic importance, has been called the Greenhouse Leaf-tyer, from the habit of the larvae of drawing the leaves together, and tying them with silk. When this caterpillar is at rest it has the habit of curling round to the side of the body the head and first three, or four, segments. Many of the larvae of the smaller species of moths fold, or roll over the edge of a leaf and seal down the whole of the turned edge with threads of silk. These small caterpillars live through all their larval stages inside the same enclosure, in which they also change to the chrysalis state. Everyone must have noticed the work of the common Basswood Leaf-roller, *Pantographa limata*, G. & R. This larva cuts a leaf half way across the middle, and then rolls the end portion into a tube, within which it lives.

Some caterpillars when at rest assume curious positions. Many geometrid larvae have the habit of extending the whole body straight out into the air, the anal prolegs and feet firmly clutching the twig, or leaf, upon which they happen to be. They often remain in this position for a considerable length of time, without even slightly moving the body. In numerous instances the colour of the caterpillar, and the object upon which it is resting, is almost, if not quite the same, and the larva may appear as an additional twig, the casual observer being unable to differentiate between the living caterpillar and the object upon which it rests. The

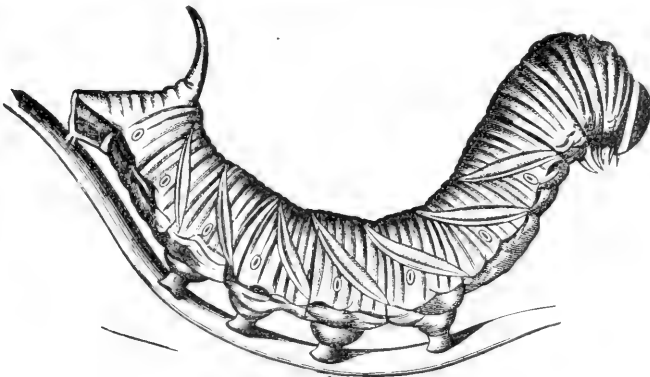


Fig. 54. Sphinx caterpillar.

larvae of the Sphingidae, or Hawk-moths, when resting have the habit of rearing the front of the body into the air, curling the head and first segment, down in a most stately manner (Fig. 54). They have been known to remain in this position perfectly motionless for hours. On account of this habit they are when thus resting supposed to resemble the Egyptian Sphinx, and owing to this resemblance the name Sphinx, and the family Sphingidae is due.

The fruit of the raspberry is occasionally injured to some extent by the larvae of the Raspberry Geometer, *Synchlora rubivora*, Riley, Fig. 55. This caterpillar is furnished on each segment with several short bristles, or spines, and has the habit of disguising itself, by at

taching to these spines, very small bits of vegetable matter, such as the anthers of flowers, tiny pieces of leaves, etc. Owing to this habit it usually escapes detection. The curious larva of *Harrisimemna trisignata*, Walk, attaches pieces of its cast skin etc. to some long hairs on the front segments. When at rest the thoracic feet are drawn up close to the body and the front segments raised, giving it a very uncaterpillar-like appearance.

Although presenting sometimes a rather formidable appearance, with the exception of one or two kinds which are provided with irritating hairs, caterpillars are quite harmless. Some of the Sphingidæ will jerk their heads from side to side and even snap their mandibles, but they are unable to bite anything thicker than

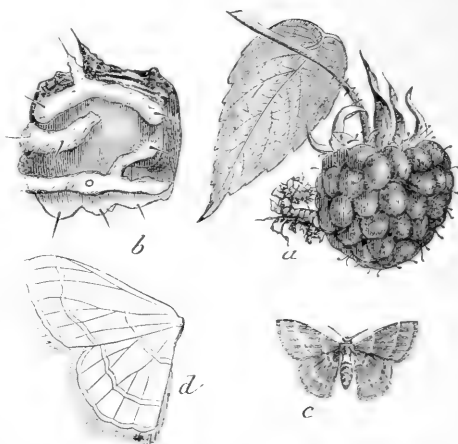


Fig. 55. Raspberry Geometer: *a* larva, natural size, on fruit; *b* segment, magnified, showing hairs, etc.; *c* moth, natural size; *d* pair of wings enlarged—colour pale green.



Fig. 56. *Hyperchiria Io*, caterpillar.

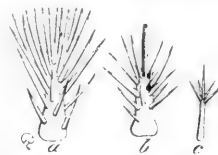


Fig. 57. Spines of *Io*, caterpillar, magnified

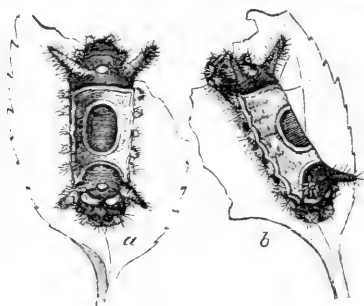


Fig. 58. *Empretia stimulea* caterpillars.

the edge of a leaf. The best known stinging larvae are the pretty caterpillars of *Hyperchiria Io*, Fabr., (Fig. 56,) every point of whose mosslike covering is a poisoned dart, (Fig. 57,) Several of the slug caterpillars, as *Empretia stimulea*, Clem, are also able to leave unpleasant reminders when handled, (Fig. 58.) The hairs of the larvae of the Brown-tailed moth *Euproctis chrysorrhæa*, Linn, are likewise excessively irritating to the skin.

In conclusion the writer can only express the hope that this limited mention of some of these interesting habits may not be without some result, and that those who have never had the pleasure of watching the many habits of lepidopterous larvae, may be led sometimes to take an interest in these creatures—the larval state of our butterflies and moths. Every species of caterpillar is worthy of study, and as so little is known of the preparatory stages of most of the lepidoptera, particularly of the moths, there is in this branch of study alone, a vast field for research. Many points doubtless of much value, even with regard to some of our common species which as larvae, devastate our forest trees, fruit trees, and all kinds of crops, are yet to be discovered. Every little helps, and facts which may be considered worthless at the time often prove later on to be of great scientific value.

NOTES ON SEMIOPHORA YOUNGII, SMITH.

BY ARTHUR GIBSON, OTTAWA.

In the report of the Dominion Entomologist for 1901, on page 251, mention is made of a new enemy to tamarac, or the American Larch (*Larix Americana*, Mx.) and the Black Spruce, (*Picea nigra*, Poir.), viz., *Semiophora Youngii*, Smith. This insect occurred in sufficient numbers in a large peat swamp near Ottawa to cause considerable destruction. A notice of this is also made in an account of "A Day at the Mer Bleue, Eastman's Springs, Ont." by the writer. (Rep. Ent. Soc. Ont. 1901.) During the past season further observations were made on the life-history of the species, but our knowledge of the habits of the insect is still far from complete.

On the 21st May, 1902, a trip was made to the Mer Bleue, by Mr. Young and the writer, but only a few larvæ, from half to three-quarters grown, could be found, and these were very local. At this point, owing to recent fires, the only trees on the swamp are small tamaracs and spruces from two to four feet high, and what larvæ we did find were all hiding in the wet moss at the base of the tamarac trees, a few inches below the surface. No specimens could be found near the spruce trees. A great many trees in other parts of the swamp were examined, but in only the one spot could specimens be found. In every case it was necessary to search in the moss at the base of the tree to find the larvæ as no noticeable injury to the foliage could be detected. The mature caterpillar is a handsome creature "about an inch and a half in length when full grown, of a rich velvety brown, with a ruddy or greenish tinge in different specimens, the dorsal area showing the richest colours, and bounded on each side by the white clear and threadlike lateral stripes; the dorsal stripe of the same intensity as the lateral stripes; the spiracles black and lying on the upper edge of a broad white substigmatal band, the lower surface much paler than the dorsal, the whole body finely mottled with small purplish brown spots. The centre of each segment on the dorsum is darker and more velvety than the inter-segmental folds. The head is reddish brown finely mottled with lighter spots." (Fletcher.)

On the 18th September another visit was made to the locality in the hope of collecting some of the imagoes. At this time the moths of the Cranberry Looper, *Caterva catenaria*, Cram., were in great evidence—hundreds and hundreds of specimens in perfect condition. At almost every step four or five of these moths would arise from their resting places, and flutter away. Unfortunately, however, we were too late to secure good examples of the moths of *Semiophora Youngii*, Smith, but in all five specimens were taken, three by Mr. Young and two by the writer. These five specimens were in poor condition and were all collected at rest on small tamarac trees. Mr. Young put one of his specimens, a female, into a chip box, and secured some eggs, half of which he gave to the Division of Entomology. These were laid on the 19th Sept. and the young larvæ hatched out of doors on the 28th and 29th Sept. The following brief description was taken of Stage I—Head, brown. Body cylindrical, semi-translucent, pale greenish after feeding. Thoracic shield concolorous with head. Tubercles black and shiny. No markings on the body. The young larvæ loop when walking.

On the 16th Oct., in company with Dr. Fletcher and Mr. W. S. Odell, an enthusiastic microscopist, another trip was made to the Mer Bleue, and on this occasion two pupæ, of what we take to be *Semiophora Youngii*, Smith, were found by the writer, in the moss at the base of a small tree. One of these was dead, but the other contained a living, rather large hymenopterous parasite, almost fully formed, which could be distinctly seen moving inside. This pupa has been kept in a warm office ever since, but the parasite has not as yet emerged (1st Dec.) although still active inside the pupa.*

* Since the above was written the parasite has emerged, and Mr. Harrington tells me that it is a species of *Anomalus*, not previously taken here and unknown to him.

The same day Dr. Fletcher collected a small noctuid larva about half an inch in length in the wet moss at the base of a small tamarac tree. This looks very much like the caterpillar of *Semiophora Youngii*, Smith. It is still alive and is hibernating out of doors.

INSECTS INJURIOUS TO ONTARIO CROPS IN 1902.

BY DR. JAMES FLETCHER, DOMINION ENTOMOLOGIST.

The season of 1902 has been a rather unusual one in all parts of Canada. Exceptional rain fall has been recorded during the summer at almost all localities, and this has had a perceptible effect upon the abundance, or the reverse, of many of the well-known pests of the farm and garden, as well as upon the development of some of the staple crops. Late spring frosts were answerable for a considerable injury to grape and other fruit crops, including an affection of the leaves of apple trees generally referred to by correspondents under the term "yellowing of apple leaves," and also probably for a curious premature ripening of potatoes, which could not be referred to any of the known fungous diseases.

CEREAL CROPS.

In the Province of Ontario cereal crops were little injured by insects, the chief damage complained of being due to heavy rains. Rust was prevalent in many places, and complaints of lodging on account of heavy straw were frequent. Peas, which once formed such an important crop in Ontario, were little sown this season, owing particularly to the depredations of the Pea Weevil. The Pea Moth was less destructive than usual, and the Destructive Pea Aphis was only mentioned from a few localities, upon late peas and the grass pea. The grass pea, *Lathyrus sativus*, L., a pea-like plant belonging to the bean family, is not a true pea, but the seed resembles peas so much that it was hoped that, as this plant is entirely free from the attacks of the Pea Weevil, it might prove a valuable substitute for peas in those districts where the Pea Weevil is destructive. These hopes, however, during the past season have been disappointed, probably on account of the season; the grass pea, being of tropical origin, seems to require more heat than we have had during the summer of 1902. The seeds ripened unevenly, and the plants continued growing and flowering right up to frost. Late in the season in some places it was attacked by the Pea Aphis. However, in some seasons during the many years it has been grown, it has been known to give excellent crops, of from 10 to 30 bushels to the acre, of excellent peas, which can be used for most of the same purposes as real peas. Field peas, where sown late, were injured by mildew, and in the southern counties were seriously affected by the Pea Weevil. Beans were much injured by the weather. Late frosts in spring and heavy rains made re-planting necessary in a great many places. Fodder crops with the exception of corn, yielded heavily, but wet weather at haying time made it sometimes difficult to save the crop. There was a general complaint that clover did not form seed, even where there was no midge. Wheat and oats, our most important cereal crops, were of good quality and yielded heavily. A most satisfactory and unexpected condition prevailed throughout the whole province, as far as the Hessian Fly is concerned. This is largely due to farmers having followed the advice given by specialists as to the best means of avoiding injury from the attacks of this insect. Most farmers speak of its absence as "a most remarkable disappearance." The only serious injury by the Hessian Fly recorded in Canada this year was in Manitoba, where, however, as only spring grain is sown and as there is there only one brood of the insect in the year, as far as we know, the Hessian Fly can be kept in check with comparative ease. Grasshoppers were troublesome in some parts of western Ontario, where they also occurred last year. They appeared again in destructive numbers in Manitoba, but wherever

the Criddle mixture was applied, most satisfactory results followed. It will be well for farmers, should grasshoppers appear in Ontario again next year, to give this mixture a trial. It is a great improvement on the well-known poisoned bran mash, which has been so widely used against cutworms and also to a less extent against grasshoppers. Mr. N. Criddle, of Aweme, Man., noticed that grasshoppers were very much attracted to fresh horse droppings, and he at once tried substituting that material, which is always obtainable on farms without cost, for the, in Manitoba, very expensive bran. The results were so satisfactory that many of the farmers in his district used the mixture during the past summer and saved their crop. This mixture consists of one pound of Paris green mixed with sixty pounds of fresh horse droppings. To this is added two pounds of salt, and the mixture is then scattered broadcast around the edges of the fields by means of a trowel or wooden paddle. It is probable that even a weaker mixture than the above will prove effective.

The pea crop as stated above was a small one in Ontario this year. Few field peas were planted and these only in northern counties. This is due almost entirely to the prevalence of the Pea Weevil, more generally known as the "Pea Bug," which is by far the worst enemy of this important crop. It is indeed at the present time one of the most destructive enemies of farm crops, demanding the urgent attention of farmers in Canada and the United States. The pea crop is one of very great importance, and there is no other which quite takes its place for feeding. The loss is now enormous, probably nearly one million dollars a year in Ontario alone, and yet there is a simple and effective remedy, which is well known and may be said to be perfectly satisfactory in every way, as it is effective, easy of application and of comparatively small cost. A great effort is now being made to stir up public opinion in this matter and get some definite concerted action taken during the present winter and next year, so as to induce pea growers to follow the advice which has been so often given. It does not seem unreasonable to hope, in view of the peculiar circumstances of this case, that in one year a perceptible change might be made in the amount of infested and injured peas on the market, and, with this insect, more perhaps than with any other, total extermination seems a possibility if all will work together; but united action would have to be taken in all parts of Ontario and the northern United States where seed peas are grown. Many farmers have already given up growing peas, and others are talking of doing the same. The facts of this infestation and the problem which they involve, are simpler than is ordinarily the case with a pest of equal magnitude. The Pea Weevil, as a regular crop pest, only occurs in Canada in certain counties of Ontario, and there are still many places in the north where good peas can be grown free of this pest. The counties worst affected are those lying just north of Lakes Ontario and Erie. It is an exotic insect and has no native food plant, its only known food being the cultivated pea, which is also an exotic and will not winter over in this country. Every pea, therefore, which is sown in spring, has passed through the hands of seedsmen and others, and thus it has been possible at some time to treat this seed before it is sown. A remedy which is perfectly effective and easy of application by everyone with ordinary care, is to fumigate the seed before sowing with bisulphide of carbon. The large seed merchants, for this purpose have special buildings called "bug-houses" and practise this remedy regularly, finding it quite satisfactory; and, were it not for farmers and gardeners who grow a few peas for their own use and will not adopt the proper means of destroying the weevils before sowing their seed, there would be little difficulty in quickly bringing down the numbers of this destructive enemy. Now, however, some seedsmen who formerly fumigated their seed regularly, are omitting to do so, claiming that their efforts are useless all the time there are so many who do nothing. Although treated seeds may contain no weevils, yet in an infested district a crop grown from clean seed may still become infested by weevils which will fly in from the surrounding district, where seeds containing living weevils had been sown, or from insects which emerged the previous autumn.

The full grown Pea Weevil, is a small, roundish, very active beetle about one-sixth of an inch in length, greyish brown in colour and bearing two conspicuous black spots at the end of the abdomen above. (See figure). These beetles lay their eggs on the green pods; from these, small white grubs hatch, which bore in and attack the nearest seed inside the pod. They penetrate by a minute hole which is afterwards almost obliterated by the growth of the increasing seed. There is only a single insect inside each seed, and it remains there until fully developed.



This takes place perhaps, as an average date, by the middle of August, and, as a rule, most of the weevils remain in the seeds till the following spring. However, and this is one of the greatest difficulties in getting a perfect remedy for the Pea Weevil, some of the beetles, in certain seasons a large proportion of them, leave the peas in autumn and pass the winter about barns, buildings, etc. This makes it necessary to reap and thresh as soon as possible, so that the seed may be treated before the weevils leave it. Some of the best seed dealers have for years been urging upon growers the importance of this and have sent out printed circulars to their customers, offering a higher price for seeds delivered by a certain date, so that the injury may be as little as possible; the grain, being harvested before it is dead ripe, is also of better quality and germinates better. Efforts will be made during the coming winter to have this matter fully discussed at all the farmer's meetings in the Province. I am convinced that this problem of stamping out the Pea Weevil entirely, is a matter of possibility if farmers and seed merchants will only work together for a short time and carry out the instructions given. The Pea Crop of Canada is far too important for farmers to give up growing it, nor do I think that this would be a wise course to adopt, until a much greater effort has been made to get farmers to use the common sense plan which has proved so successful with those who have tried it. An old and well-tried remedy is to hold over seed peas till the second year before sowing. The beetles will emerge the first spring and will die inside the bags. Another good plan is to treat the seed with coal oil 1 gallon to 20 bushels of seed, turning the seed thoroughly with a shovel every day for 4 or 5 days.

ROOT CROPS.

There has been a noticeable absence of some of the destructive enemies of root crops. The Turnip Aphis has hardly appeared. The Cabbage Butterfly, which last year was so injurious to cabbages, turnips and rape, has been very much reduced in numbers by bacterial and insect parasites. The Colorado Potato Beetle was troublesome where neglected, but is easily kept in check with the ordinary poison applications. The advisability of applying Paris green or some other poison in Bordeaux mixture has been demonstrated this year, when the Potato Rot has very much reduced crops which were not protected by this useful remedy. The Bordeaux mixture, consisting (for potatoes) of 6 lbs. of copper sulphate, 4 lbs. of fresh lime and 40 gallons of water, as a remedy for this terribly widespread and destructive disease, is one of the greatest triumphs of modern applied science. It always pays to apply it to growing potatoes to protect them against various fungous enemies, and it has been found that the ordinary poisons which destroy insects may be applied mixed with the Bordeaux mixture, without lessening the effect of either. The Gray Blister-beetle, *Macrobasis unicolor*, Kirby, was reported from a few places, but no serious injury was done, and it must be remembered that the occurrence of these beetles in large numbers indicates that many locusts have been, or will be, destroyed, because the larvæ of the blister-beetles feed entirely upon the eggs of grasshoppers. Asparagus Beetles occurred in numbers in the Niagara Peninsula, and have spread somewhat during the past year. The remedies most relied on are dusting larvæ freely with freshly slaked lime, collecting the beetles in beating nets and applying poisoned sprays to the food plant.

As a consequence of the wet season, Slugs have been more abundant than usual, and several complaints have been received of their injuries to root crops and various garden plants. These molluscs are seldom troublesome, except in damp places or in wet seasons. The best remedy is to dust plants lightly for three or four consecutive evenings, just at dew fall, with freshly slaked lime, which adheres to the viscid coating of the slugs, and causes them great discomfort, as is shown by the copious out-pouring of the slimy secretion. After two or three applications the animal loses the power of producing slime and dies. The lime has no injurious effect on plants and indeed is beneficial on many lands. When these creatures, as is sometimes the case, give trouble in greenhouses, lime or salt may be dusted between the flower pots on the benches; a good bait which attracts slugs and snails very much, is bran damped sufficiently to make it adhere. A very small quantity of Paris green may be added to this and will soon clear out the marauders. In greenhouses the poisoned bran or oat-meal may be placed on slips of glass, which can be put out at night and removed during the day.

FRUIT CROPS.

The fruit crops of the province have been on the whole satisfactory, although irregular. In some places heavy yields were secured, but in others there was a shortage. The ordinary insect enemies have been less abundant than for many years, but fungous diseases, particularly the Black Spot of the Apple, have caused loss in most districts, and in a few places the Sooty fungus, *Lahrella pomi*, has appeared. This produces on some varieties, particularly Rhode Island Greenings, an unsightly appearance which is known in the trade under the name of "Clouded Fruit." There has been a remarkable absence of injury from the Codling Moth, Cankerworms and Tent Caterpillars. Plums are reported as a light yield, owing to late spring frosts and excessive rain. Where spraying has been neglected, great injury has been done by the Plum Curculio, and the Plum Rot has been more prevalent than for many years. This fungus every year destroys enormous numbers of peaches and plums, and the dried mummified fruit may frequently be seen in orchards otherwise well cared for. It is a most important part of the remedy for this disease, to gather, from the ground when they fall and from the trees after they have dried up, the diseased fruits, because in these is found the most fertile source of infestation of the crop of the following year. All should be burnt before the spring opens, and the trees should be sprayed carefully just after blossoming with poisoned Bordeaux mixture, which will have the double effect of checking the fungus and preventing injury by the Plum Curculio. The absence of so many of the regular enemies of the orchard must be due in a large measure to the season, but also certainly to the increasingly large number of fruit growers who now carry on their work in a scientific practical manner, spraying thoroughly and using the remedies which experience has shown are the proper ones for the different pests. The word "spraying", however, to many who endeavor to practise this operation, has still little more meaning than doing something, in any sort of a way, to fruit trees with a spraying pump. It cannot be too often insisted upon, that spraying is the operation of applying by means of a force pump and spraying nozzle a special liquid mixture, which varies according to the habits of the insect to be treated, with such force as to break up the liquid so thoroughly that it falls upon the plants treated as an actual mist or spray. Such terms as "sprinkling" and "showering" are inaccurate for the operation intended. Undoubtedly, much of the so-called spraying, as usually done, would be more accurately designated by these terms which describe a much less careful and less even distribution of liquids. The Eye-spotted Bud-moth has been rather troublesome in apple and plum orchards, particularly in the eastern counties and down through the Maritime Provinces.

The subject of the injurious Scale Insects of the orchard, to which so much attention has been directed of recent years, owing to the unfortunate introduction into our province of the San José scale, has done much to show the value of a practical knowledge of Entomology.

This has been brought prominently before the fruit growers of Canada by means of the magnificent work which has been carried on by the Honourable John Dryden, Minister of Agriculture for Ontario, through two members of the Council of our Society, Mr. Geo. E. Fisher and Prof. Lochhead, whose efforts have been well seconded by the nurserymen of the province, who have been most assiduous in conforming to all requirements which the Minister thought it wise to impose. As a consequence of this, the condition of orchards, as far as other scale insects and various other pests are concerned, is actually better than it was before the advent of the San José scale. The standard remedies for scale insects, kerosene emulsion and whale-oil soap solution, are now pretty well known and generally adopted. The Oyster-shell Bark-louse, next to the San José scale, is the one which does most harm. Where this occurs upon trees in the San José scale district, it is, of course, destroyed at the same time as that scale, when trees are treated with the drastic measures which have been found necessary. When trees are found



Fig. 59.—Oyster-shell bark louse on a twig.

to be infested by the Oyster-shell Bark-louse (Fig. 59), the proper steps to take are to spray the trees early in the winter with a simple whitewash containing one pound of fresh lime in every gallon of water. Two applications should be made, the second wash may be applied as soon as the first is dry. In spring invigorate the trees by spudding in a light application of well rotted manure around the roots, and during the summer spray the trees, at the time the young scale insects hatch, with kerosene emulsion or a whale-oil soap solution. For the San José scale the latest results obtained by Mr. Fisher have proved that this insect can be controlled by spraying infested trees early in spring with the California Lime-Sulphur and Salt wash, which Mr. Fisher has modified—he thinks, with equally good results—by omitting the salt. This treatment must be followed during the summer by spraying with kerosene emulsion. I have visited Mr. Fisher's experimental orchards several times and have seen the excellent results which he has secured; these are certainly a monument not only to his great perseverance but to the foresight of the Provincial Minister of Agriculture, under whose instigation the many and various experiments carried out by Mr. Fisher were made.

In some orchards at Queenston and Niagara there are some interesting occurrences of the Plum Gall-mite, *Cecidoptes pruni*, Am., which are now receiving experimental treatment. The small round galls are clustered around the twigs and increase in numbers very rapidly. The injury to the tree is not very apparent at first, but ultimately the twigs are destroyed. The extremely small mites live in large numbers inside the galls, which are only one-sixteenth of an inch in diameter. There is apparently no opening to them except just at the time the mites emerge. Applications sprayed over the trees have so far proved unsatisfactory. Mr. Fisher has tried fumigating with hydrocyanic acid gas, and, although at first this was apparently successful, many of the mites certainly being killed, later examinations have shown that it is not a satisfactory remedy.

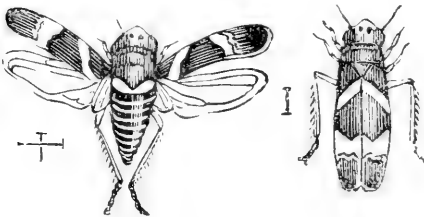


Fig. 60.—Grape-vine Leaf-hopper, much magnified.

The Grape-vine Leaf-hopper (Fig. 60), has done considerable harm in some vineyards in the neighborhood of St. Catharines, and experiments have been carried on with a view of getting a practical remedy for these troublesome insects, well known among growers as "the thrip." The most serious injuries by this leaf-hopper are its attacks upon the Virginian Creeper, where used upon houses and arbours.

The Apple Aphis has been rather more destructive than usual, and it has been found necessary towards the end of the season to advise the spraying of trees, when it was very

abundant. This is seldom the case in Ontario, although a regular thing in British Columbia, where it is very destructive every year. Apples were seen during the past summer in Prince Edward Island, which were seriously injured by this insect; where the fruit was punctured, deep pits were left, giving the fruit a distorted and gnarled appearance, which rendered it quite unsaleable. This injury probably took place when the apples were very small. The Cherry Aphis appeared in very large numbers early in the season in western Ontario; but later there was little sign of the insect upon the trees, and its injuries were hardly noticed. It is significant that just before the disappearance of these plant-lice one of the severe frosts, already referred to, occurred, and it seems possible that this may have been answerable for the disappearance of the plant-lice. It was not, however, the only cause, for a week later many of the insects were found in some orchards in the same localities.

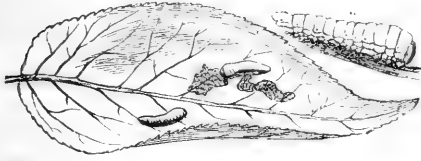


Fig. 61.—Pear-tree Slug; *a*, magnified.

fruit growers and, as a consequence, it often levies heavy tribute. The autumn brood, skeletonizing the leaves, prevents them from performing their functions and thus the crop of the following year suffers.

White Grubs (*Lechnosterna*) were complained of as troublesome in strawberry beds, as well as in potato fields and pastures. There is no good practical remedy for these insects when occurring on farm crops. Where land can be ploughed up, this should be done in August, so as to disturb the pupæ which in many species form at this time, and are very tender. The life history, as generally accepted, is that the eggs are laid in June and the young larvæ feed until August of the following year, when they pupate and assume the perfect form. The beetles, however, do not then emerge but remain in their earthen cells until the following May. When strawberry beds are attacked, undoubtedly the best remedy, which, I think, was first suggested by Mr. P. C. Dempsey, of Trenton, is to adopt the one crop method; this consists simply of planting out the new strawberry sets in spring or the previous August, and then taking the crop the next spring. As soon as such runners as are required for propagation are secured, the beds should be plowed up. White Grubs are most destructive in old beds, and, by adopting this method which also, horticulturists claim, gives the most paying crops, the insects are prevented from making headway.

Two interesting occurrences of the fungous parasite, *Cordyceps melolonthæ* (Fig. 62), came to my notice during the past season, one at Ottawa, reported by Mrs. Brown and Miss Lees, the other at Renfrew, by Mr. W. J. Kerr. These outbreaks of this beneficial fungus, although occurring rarely, as a rule, reduce the numbers of the white grubs rapidly and perceptibly where they occur.

Two comparatively new fruit pests which require attention from fruit growers, are the Blackberry Soft-scale (*Lecanium Fitchi*), which has appeared in destructive numbers upon cultivated blackberries in western and central counties, and the Rose Scale (*Diaspis rosæ*), which attacks the rose and the blackberry. In the latter case, it frequently occurs with the Blackberry Soft-scale. This latter has a conspicuous dark

The Pear Slug, *Eriocampa cerasi*, Peck (Fig. 61), was abundant in some places and did a great deal of harm by destroying the foliage of plum, cherry and pear trees. This pest seems to be very generally ignored by



Fig. 62.—White-Grub fungus.

brown polished scale about $\frac{1}{2}$ inch in diameter, hemispherical in shape, and is frequently so thickly clustered on the canes as to cover portions of them entirely. Like many other scale insects, it increases most rapidly on old or worn out plantations, and is very much attacked by both fungous and insect parasites.

The Rose Scale is much smaller and flatter. The color is clear white, and the females are circular in outline, while the males are elongated. When abundant, they give the infested plants the appearance of having been finely spattered with lime. The remedy for both of these insects is to plant new plantations from healthy beds, or to prune severely and spray early in spring with kerosene emulsion or whale-oil soap solution.

A possible enemy of the apple may be mentioned, although as yet little is known of its injuries. Last autumn I found at Ottawa three small green larvæ of a saw-fly, in cells eaten about half an inch deep into the sides of apples. The walls of the cavities were white and dry, and the orifice was closed with debris gnawed from the apple, but there was no appearance of excrement in the cavity. The mouths of the orifices, however, were hardened and of a greenish hue as though they had been made before growth had ceased. These larvæ produced last spring the common Saw-fly (*Taxonus nigrisoma* Nort). It seems probable to me that the larvæ may merely have gnawed holes into the apples as presenting a convenient place for pupation: but, as the three larvæ were in different apples from distant parts of the orchard, and all found by chance, it is just possible that they may have been abundant, and that we may have in future to deal with a new enemy of the apple. In England there is a saw-fly which causes considerable loss in the apple crop. These Canadian larvæ resemble very closely a species which is frequently abundant on docks, and some species of *Polygonum* ridding the leaves in autumn. I regret to say I took merely a superficial description of the larvæ before they pupated. I shall be glad to hear if anyone else has noticed this attack.

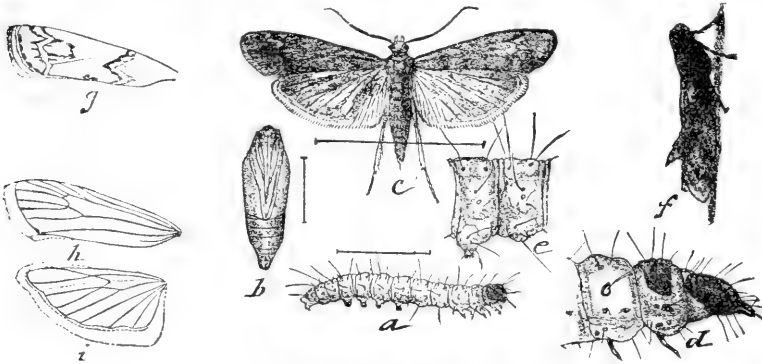


Fig. 63.—The Mediterranean Flour Moth.

The Mediterranean Flour Moth (Fig 63). An insect which has spread rapidly through Canada of late years, but of which little is said, is the above named which is a serious pest of many of our Canadian

and American flour mills. Far greater care than has been practised in the past will have to be exercised by millers in keeping their premises clean and constantly swept out, before this pest is controlled. Millers, however, now understand the habits of this insect and the best means of checking its increase. In my own experience, thorough fumigation with sulphur has given the best results, accompanied with constant cleaning up, and in winter throwing open the mills to the full intensity of the winter weather. This, if, as some claim, it does not kill the larvæ, at any rate prevents them from developing so quickly, and probably from breeding for long periods. Two different parasites have been bred by me in large numbers during the two past years from infested mills. One of these, from Rockland, Ont., has been named *Idecthis ephestia* by Mr. W. H. Ashmead, the other is probably an undescribed species, and was received from Moulinette, Ont., where it occurred in such numbers as to attract the attention of the men in the mill and obtain a popular name, "the red-tailed fly."

The Buffalo Carpet Beetle (see Fig 31) has spread largely during the past summer, and now occurs as a household pest not only in western Ontario, but as far east as Ottawa. In the Province of Quebec it is found in the eastern townships, and in Nova Scotia there is another colony in the Annapolis valley. Housekeepers should use every effort on its first appearance to clear this destructive insect out of their houses. Carpets should be taken up and beaten thoroughly out of doors, the floors mopped with scalding water, and, before replacing the carpets, strips of tarred paper should be placed round the edges of rooms. All cracks in the floors after brushing out thoroughly should be sprayed or sprinkled with gasoline. Anyone suffering from the presence of this pest will do well to look up the articles which have appeared upon this subject in our reports, or I shall be pleased to give full particulars as to treatment to anyone who will apply to me on this subject, or concerning any other injurious insects.

An allied insect *Attagenus pellio* has also been reared from larvæ which were destroying carpets at Wolfville, N.S., and which were kindly forwarded to me by Mrs. M. G. DeWolfe.

ENTOMOLOGICAL RECORD, 1902.

By DR. JAMES FLETCHER, OTTAWA.

Since the appearance of the Entomological Record of 1901, many letters have been received, not only from Canadian students, but also from specialists in the United States, testifying to its value for the purposes for which it was prepared, viz. (1) to give the names and addresses of Canadian workers in the various orders of insects and of specialists who will help others working at the same subjects; (2) to record species not previously published as occurring in Canada; (3) to give exact data as to the distribution of species, together with dates when certain insects have been captured, so that places may be visited and desirable species sought for at the time and place where they are known to have occurred; (4) to draw attention to works of particular value in the different departments of Entomology; and (5) to place on record anything which it is thought will affect the progress of the study of the insects of the Dominion.

A great many notes of captures have been received, and, from these, selections have been made for mention of such species as, in the opinion of the writer, seemed worthy of recording. Great care has been exercised in endeavoring to arrive at correct determinations, and some species which have been reported have been for the present omitted until further light has been received.

One gratifying feature has been very marked, viz. the encouragement which has been afforded to beginners and collectors living in isolated or distant localities, from bringing them into correspondence with specialists elsewhere, concerning interesting species which they have been fortunate enough to take. As a consequence, a considerable amount of exchanging has been arranged during the past year, which has been mutually advantageous to those concerned. Some species which were generally thought to be exceedingly rare, have proved, by references in last year's Entomological Record, to be merely species with restricted localities, which may occur in some abundance in those localities, easily obtained by those living there and supplying them with a valuable means of obtaining from others many species to them more desirable in exchange. I find from my correspondents that there has been a most gratifying increase in their correspondence concerning Canadian insects. In this way, many students who would never have known of each other's existence, have been brought together, and there has been a consequent increase in the knowledge of Canadian insects and their distribution. Some have expressed their appreciation of the fact that they now feel that they can do effective work as factors in one large system with a definite end in view. This feeling has induced a few to ask

advice as to the choice of some special line of investigation, which would be of particular use to the science of Entomology in Canada. I believe that in 1903 more special work will be done in the Dominion than has ever been done before. As in the past, invaluable assistance has been rendered to Canadian collectors by experts in the United States and Canada. As much of the initial correspondence has passed through my hands, I must particularly express gratitude to Dr. L. O. Howard, Dr. Harrison G. Dyar, Mr. D. W. Coquillett, and Mr. W. H. Ashmead, of Washington; Dr. J. B. Smith, of New Brunswick, N. J.; Dr. H. Skinner, of Philadelphia; Dr. Wm. Barnes, of Decatur, Ill., who spent some weeks in British Columbia and visited Alberta last summer, when he called on several of our Western members thus encouraging and assisting them very much by identifying many species seen in their collections; Mr. E. P. Van Duzee, of Buffalo; Mr. H. Bird, of Rye, N. Y.; Prof. H. F. Wickham, of Iowa City, Iowa; and Mr. W. H. Harrington, of Ottawa, all of whom have been most kind and patient in identifying species whenever submitted to them. I am pleased that, in almost all instances, Canadian collectors have gladly given specimens to these specialists upon a suggestion that they would be acceptable. When an expert authority who has gained his knowledge after many years of close study, takes the trouble to go through a large number of specimens and name them, sometimes at the expenditure of much time, the least that can be done is to make a great effort and considerable sacrifice to provide him with any specimens which he may indicate as desirable. I presume here also to remind my readers that they should be very careful to remember that return postage has to be paid by these gentlemen, but that they will very seldom mention this. The amount of postage on parcels returned may be seen by examining the postage stamps on the wrappers, and this or its equivalent should be scrupulously returned. Specimens of undescribed species, even when uniques, are useless in a private cabinet, and, when these are described by a specialist, he should at any rate have the privilege of retaining them. Such specimens when deposited in the collection of a recognized authority, are where they may be of benefit to a very large number of working entomologists, but when hidden away in a private collection they are practically useless. This should indicate the very great importance of entomologists depositing in National Museums, or in the cabinets of Societies, like our own, where there is a regular curator, specimens of great rarity, or such as are of particular interest, not only for the reason that they may be of use to the greatest number possible but also to preserve them from destruction more effectually than is possible in any private collection. When a new species is submitted for description, as full a series as possible, and of specimens in the best condition obtainable, should always be sent. Unfortunately, it is too common a practice to send a poor specimen for identification. This is largely done of course to avoid the danger of destruction in the mails; but, if specimens are firmly pinned, supported where necessary with cotton wool, and carefully packed with plenty of soft material between the box containing the specimens and the outside wrapper or box, they may now be sent with comparative safety. In the case of lepidoptera specially prized, specimens should be relaxed, taken from their pins, and put in papers for transmission by mail.

During the past year I have learnt of several more naturalists in different parts of Canada, who are working at various orders of insects. Some of these are connected with the public schools of the country, in which Nature Study has recently been recognized as an important part of education. In British Columbia the British Columbian Entomological Society, with its headquarters at Vancouver, and with a most energetic secretary in the person of Mr. R. V. Harvey, and the Rev. G. W. Taylor as President, has done excellent work during the past year in working up the insect fauna of the province. The Society has already issued three lists containing the names of such species of lepidoptera as have been identified, and similar lists of the other orders are to appear. Quarterly meetings are held for the exhibition of specimens at various centres, and a monthly serial in manuscript is circulated, giving the experiences

of the different members for the previous month. Notes upon captures, upon insects identified, and on methods and arrangement of collections, on the rearing of larvæ, etc., are added by each member upon blank sheets, and the number is then passed on to the next in order. The North-west Entomological Society, which owed its existence to the enthusiasm of Mr. Percy B. Gregson, of Blackfalds, Alta., has done such good work that it drew sufficient attention to itself for a public meeting to be called in Calgary, where its scope was extended and the name of the Society changed to the Territorial Natural History Society, with the following objects:—To instruct farmers as to the nature of beneficial and injurious insects, weeds and birds, and to establish natural history museums at central points in connection with schools, etc. Arrangements have already been made to establish museums of natural history at Blackfalds, Lacombe, Calgary and Regina. The last of these will be in the care of Mr. T. N. Willing, the Territorial Government Weed Inspector, who is a keen observer and enthusiastic naturalist. Mr. Willing is also the secretary of the new Society.

LITERATURE.

Bibliographical notes on entomology have appeared regularly as usual in entomological journals and scientific magazines, and a Bibliography of Canadian Entomology is prepared annually for the Royal Society of Canada by Dr. C. J. S. Bethune, and appears in its transactions. The Canadian Entomologist (London, Ont.), *Le Naturaliste Canadien*, and the Ottawa Naturalist are indispensable to the working entomologist. The same also must be said of the American Naturalist, Entomological News, *Psyche*, Journal of the New York Entomological Society, Transactions of the Amer. Ent'l. Soc'y. and Science. In these publications every book of importance is noticed, and there is no necessity here to make particular mention of many works of a general nature which have appeared during the past year.

I would, however, direct attention to "Caterpillars and their Moths" by Miss I. M. Eliot and Miss Caroline G. Soule. This is a charming book, written in an attractive style, which illustrates on every page the great fascination there is in rearing insects from the egg and also how important discoveries may be made by close observers, even in the case of well known insects. The clear descriptions of methods, and hints on breeding, will be found very helpful, even to many who have had considerable experience in this work.

"The Common Spiders of the United States," by J. H. Emerton. This makes accessible a new field of study in a subject of great interest to everyone. The book is well illustrated and each of the 200 or more species is figured and described in simple language. It is a welcome addition to our literature.

"The Book of Bugs," by Harvey Sutherland. Notwithstanding the title, which will perhaps deter some from examining it, this book, which is written in a novel, racy style, will induce all who open it to read on and on to the end, and in doing so they will obtain many useful and accurate facts concerning several common insects and some bugs. It will also probably commend itself to a class of readers who will be benefited by the information given and who might not be reached by the ordinary works on entomology.

SPECIALISTS.

It is to be hoped that now this record provides a means of bringing collectors in all parts of the country into correspondence, some of those, who make general collections including all orders, may specialize their studies more, so that, while not giving up their general collection, they may make a particular study of some one order. A few have recently signified their determination to do this, and the specialists mentioned below will be glad to correspond with collectors concerning the insects mentioned in connection with their names. Canada is so large that specialists are urgently needed in every Province of the Dominion, not only of orders, but

also of families, or even separate genera. The lepidoptera and coleoptera have always been fairly well worked, but specialists in the other orders are few, notwithstanding the good work which doubtless can be done. The hymenoptera, diptera, and hemiptera have a few devotees, but many of the other orders are almost entirely neglected. The orders which perhaps most demand attention at the present time, are the orthoptera and the neuroptera. It is strange, in view of the enormous damage sometimes done by locusts, that so few students have devoted attention to them. The odonata also offer an almost unworked field for original research. It is to be hoped that, before long, some will take up these orders more energetically than has been done in the past.

As a matter of course the reference collections, including all orders of insects of the Entomological Society of Ontario, at London, of the Division of Entomology, at Ottawa, and of the Agricultural College at Guelph, are being added to continually. To the best of their ability the officers at the Division of Entomology, at Ottawa, will name, or get named, insects in all orders, and will be glad to help or advise in any way in their power all applications for information concerning insects.

Collectors in the field have frequent opportunities of catching insects belonging to other orders than those which they study. I would point out that very little trouble is required to pin such specimens without setting them, and attach a label with the date and locality. These may then be put on one side in a cigar box, to be sent when convenient to specialists. In this way, with little labour great service may be done to entomology. If Canadian collectors will save specimens as suggested and forward them to me (parcels and letters concerning insects may be sent to me without postage), I shall be pleased to forward them to any specialists they may designate. The information conveyed with these specimens as to the distribution and date of occurrence of insects will be of great value in the official work of the Division of Entomology, and collectors will be at no expense for postage.

The following are making special studies :—

LEPIDOPTERA.

Rearing from the egg. Messrs. Lyman and Brainerd, of Montreal, Rev. Dr. Fyles, Quebec, Messrs. C. H. Young, Hurdman's Bridge. A. Gibson, and J. Fletcher, Ottawa, J. W. Cockle, Kaslo, B. C.

Diurnals. H. H. Lyman, Montreal, J. Fletcher, Ottawa, F. H. Wolley-Dod, Millarville, Alta

Nocturnals. The Genus *Hydroecia*, Messrs. A. F. Winn and H. H. Lyman, of Montreal, and J. A. Moffat, of London. The genus *Apantesis* (*Arctia*) A. Gibson, Ottawa. The Genus *Carneades*, F. H. Wolley-Dod, Millarville, Alta. The Geometridae.—Several collectors have agreed to make a special study of the geometers. The Rev. G. W. Taylor on the Pacific Coast and Mr. W. McIntosh, on the Atlantic seaboard, and the Division of Entomology of the Government Experimental Farm, at Ottawa, have already begun a critical study of these moths. Messrs. A. W. Hanham, and E. F. Heath have made large collections of the geometers of Manitoba. It is a favourite group with Mr. Hanham, who now lives at Victoria, and he will doubtless help in working up the Vancouver Island species. The Rev. G. W. Taylor, at a recent meeting of the British Columbia Entomological Society, showed four drawers of geometers containing 700 specimens representing 144 good species, nearly all of which had been taken this year at Wellington, B. C. Mr. Cockle has collected geometers assiduously in the Kootenays, and so much work on these interesting moths is now in progress that I have decided to hold over all references to captures in this family until next year's Record, when it is to be hoped that Dr. Dyar's anxiously looked for catalogue of the lepidoptera of North America, will have appeared. In the same way, it is perhaps advisable, in the mean-

time, not to record the various species of Hydræcias which are being studied by many, as new light is daily being received, particularly through the excellent work of Mr. Henry Bird, of Rye, N. Y., in rearing the species from their food plants.

COLEOPTERA.

Our highest authority in this order is Mr. W. H. Harrington, of Ottawa. Mr. R. J. Crew, of Toronto, who has for many years done good work, is devoting special attention to the Pselaphidæ. Mr. J. D. Evans, of Trenton, is making a critical study of the genus *Lachnosterna*. And Mr. E. P. Venables, of Vernon, B. C., is going to devote his time specially to beetles.

HYMENOPTERA.

Mr. Harrington again is our leading authority in this order, and is constantly naming material. The hymenoptera of the Okanagan Valley in British Columbia, will be specially collected by Mr. Venables.

I have requested Mr. W. H. Harrington to prepare the record of hymenoptera for 1902, which he has kindly done. It would certainly be advantageous if each Order could be treated of by some one who is working specially upon it, and in future this may perhaps be arranged.

DIPTERA.

Large collections have been made by Mr. Harrington, at Ottawa, and Mr. G. Gagnon, at Montreal. Mr. Venables has collected many species of Tabanidæ at Vernon, B.C. Next season, Mr. W. McIntosh, of St. John, N. B., intends to devote much time to this order.

HEMIPTERA

Mr. W. H. Harrington has for many years collected these insects, and has named much material for correspondents. He has also published in the *Ottawa Naturalist* a list of the Ottawa species. During the past summer the Rev. G. W. Taylor has been studying the Vancouver Island forms with the help of Mr. E. P. Van Duzee, of Buffalo, and has collected this year about 125 distinct species. Mr. C. Stevenson, of Montreal, will study the heteroptera of the Island of Montreal, the Rev. T. W. Fyles, the scale insects of the Province of Quebec, and Prof. Lochhead, those of Ontario next season.

ORTHOPTERA.

Mr. E. M. Walker, of Toronto, is so far our only authority in this order. In the west Mr. Norman Criddle, at Aweme, Man., and Mr. T. N. Willing, at various points in the Northwest Territories have collected material, which has added much to our knowledge of these insects.

THE SEASON OF 1902.

The wet dull season of 1902 in all parts of Canada has been very unpropitious for the collector of insects. The persevering collector, however, has as usual added little by little to his collection by constantly being on the alert. A few records of remarkable catches on certain evenings have been received from lepidopterists. Mr. E. Firmstone Heath, of Cartwright, Man., mentions May 22, as such, and Mr. A. J. Dennis, of Beulah, Man., had an exceptional experience of the same kind on June 11; Mr. J. D. Evans, of Trenton, Ont., and Mr. C. H. Young, of Hurdman's Bridge, Ont., also report good occasional nights, but in most places the season of 1902 must be characterised as exceptionally poor. Many of the well known crop pests were also noticeably less abundant than usual.

The following list gives the names of the most active workers in Canada which have been heard from during the past year. There are doubtless many others, but I have not heard from them during 1902. The initials in parentheses after their names indicate the orders they are studying, or if they have general collections.

- Anderson, E. M., Victoria, B. C. (L.)
 Bethune, Rev. C. J. S., London, Ont. (Gen., L., C.)
 Bégin, Rev. P. A., Sherbrooke, Q. (Gen.)
 Bice, J., London, Ont. (L.)
 Baird, Thomas, High River, Alta. (Gen.)
 Browne, Edgar J., London, Ont. (L., C.)
 Brainerd, Dwight, Montreal. (L.)
 Bryant, Theodore, Wellington, B. C. (L.)
 Bush, A., Vancouver, B. C. (L.)
 Chagnon, Gus., Montreal. (D., C.)
 Cockle, J. W., Kaslo, B. C. (L.)
 Criddle, N., Aweme, Man. (L., Or., C.)
 Crew, R. J., Toronto. (C.)
 Dennis, A. J., Beulah, Man. (L.)
 Desrochers, Rev. J. E., Rigaud, Q. (L., C.)
 Dod, F. H. Wolley-, Millarville, Alta (L.)
 Draper, R., Vancouver. (L.)
 Evans, J. D., Trenton, Ont. (Gen., L., C., Hym.)
 Fletcher, Dr. J., Ottawa. (Gen., L., C.)
 Fyles, Rev. Thos. W., Levis, Que. (Gen., L., Hym.)
 Gibson, Arthur, Ottawa. (L.)
 Grant, C. E. Orillia, Ont. (L.)
 Gregson, P. B., Blackfalds, Alta. (Gen.)
 Hanham, A. W., Victoria, B. C. (L., C.)
 Harrington, W. H., Ottawa. (C., Hym., Hem., D.)
 Harvey, R. V., Vancouver. (L., Odon.)
 Heath, E. F., Cartwright, Man. (L.)
 Huard, Rev. Victor. Quebec. (Gen.)
 Jones, W. A. Dashwood, New Westminster. B. C. (L.)
 Lochhead, Prof. W., Guelph, Ont. (Gen., Or.)
 Lyman, H. H., Montreal. (L.)
 McIntosh, W., St. John, N. B. (L., D., C.)
 MacLaughlin, T. J., Ottawa. (Odon.)
 Marmont, L. E., Rounthwaite, Man. (L.)
 Metcalfe, W., Ottawa. (L., C.)
 Moffat, J. A., London. (L.)
 Parsons, C., London. (L., C.)
 Perrin, Jos., Halifax, N. S. (L.)
 Norris, A. E., Montreal. (L., Hem.)
 Ouellet, Rev. C. J., Montreal. (C., Hym.)
 Richard, A. E., Ottawa. (L.)
 Roy, Rev. Elias, Levis, Q. (C.)
 Sanderoock, W. C., Lauder, Man. (L.)
 Simpson, Willibert, Ottawa. (C.)
 Sutfield, J. D., Morden, Man. (L.)
 Sanson, N. B., Banff, Alta. (Gen., L.)
 Schmitt, Dr. J., Anticosti. (Gen.)
 Stevenson, Charles, Montreal. (L., Hem.)
 Tanton, J., London, Ont. (L.)
 Taylor, Rev. G. W., Wellington, B. C. (L., Hem., C.)
 Venables, E. P., Vernon, B. C. (L., C., Hym.)
 Walker, E. M., Toronto. (Or. Odon.)
 Winn, A. F., Montreal. (L.)
 Wilson, E., Vancouver. (L.)
 Wilson, Jno., Vancouver (L.)
 Wilson, T., Vancouver. (L.)
 Williams, J. B., Toronto. (L.)
 Willing, T. N., Regina. (L., Or., C.)
 Young, C. H., Hurdman's Bridge, Ont. (L.)

NOTES OF CAPTURES.

LEPIDOPTERA.

(Arranged according to Smith's List of the Lepidoptera of Boreal America.)

RHOPALOCERA.

- Argynnis idalia*, Dru. Aweme (Criddle).
Argynnis astarte, Db.-Hw. Sulphur Mountain, Banff, 27 June: (Sanson). Mountain just above Lake Agnes, Laggan, B. C., 18 Aug. (Dr. W. Barnes).
Argynnis tricoloris, Hbn. Nepigon, 12 July. Not previously taken at this locality. The specimen was a female from which about a dozen eggs were obtained and the larvæ were carried to hibernation. Food plant, *Viola cucullata*. Fletcher).
Melitæa Harrisii, Scud. Abundant, Halifax, N. S. (Perrin).
Graptæ gracilis, G. & R. Anticosti, (Dr. J. Schmitt).
Cononympha inornata, Edw. Several specimens of this little satyrid have been taken during the past summer in localities very distant from previous records. Rockcliffe, Ottawa, near the Rifle Range, 14 June, (Richard); Piedmont, Que. (Norris). St. Hilaire, Que., 22 June, (Stevenson).

- Erebia disa*, Thunb., var. *maucinus*, Db.-Hw. A few specimens of this very local species were taken by Mr. N. B. Sanson at Banff, Alta., in the middle of July. Mr. Sanson obtained eggs, from which larvæ at Ottawa are now hibernating after second moult.
- Chionobas jutta*, Hbn. A new locality for this species has been found by Mr. A. E. Richard at Langevin, Que., 50 miles south of Quebec city, 27 July.
- Thecla spinetorum*, Bdv. A fine male of this rare species was taken at Fairview, B. C., (Edmund Reynolds).
- Thecla irus*, Gdt. Anticosti, (Schmitt).
- Chrysophanus dorcas*, Kirby. Rounthwaite, Man., (Marmont).
- Papilio crespontes*, Cram. More abundant than for many years, London, (Moffat).
- Pieris napi*, Esp., var. *bryoniæ*, Ochs. Banff, Alta., 3 May, (Sanson).
- Papilio nitra*, Edw. High River, Alta., (T. Baird).
- Pamphila pawnee*, Dodge. Cartwright, (Heath). Aweme, (Criddle).
- Terias lisa*, Bd-Lec. Ottawa, 18 Oct. (Gibson).
- Carterocephalus mandan*, Edw. Halifax, (Perrin).

HETEROCCERA.

- Lepisesia ulalume*, Strk. Mr. Harvey writes to me that the specimen credited to him in last year's record was taken by Mr. E. Wilson. Two fresh records have been received for 1902. 26 May, Vancouver, B. C., (Bush); and a second by the Hon. N. C. Rothschild, near the same place.
- Deidamia inscripta*, Harr. London, (J. Bice and J. Tanton).
- Philampelus pandorus*, Hbn. Trenton, 20 Aug., (Evans).
- Ampelophaga versicolor*, Harr. London, (J. Bice).
- Protoparce cingulata*, Fab. "St. John, 5 Oct. I had no occurrence of this fine hawk-moth in New Brunswick until now. I have just caught two specimens." (McIntosh).
- Albuna pyramidalis*, Walk. This species is not uncommon at Nepigon, north of Lake Superior, and may frequently be seen along the railway track. In July last the writer took five specimens flying around a raspberry bush. There were two females and three males, and the variations of colour covered all the three varieties, var. *montana*, var. *rubescens* and var. *coloradensis*, which are recognized in Beutenmuller's Monograph of the Sesiidae. The two varieties *rubescens* and *coloradensis* were also taken this year at Vancouver by Mr. Harvey, and the var. *montana* by Mr. Cockle at Kaslo.
- Sesia albicornis*, H. Edw. A specimen taken at Ottawa some years ago by the Rev. G. W. Taylor is this species. It has not been previously recorded for this locality.
- Sarothripa columbiana*, H. Edw. Victoria, May, (Anderson and Hanham).
- Arctia yarrowi*, Stretch. This rare species only once previously recorded in Canada from Hudson Bay by Dr. Robert Bell, was taken on 18 Aug. last in the Rocky Mountains, on a bare summit above Lake Agnes, Laggan, Alta., (Dr. W. Barnes).
- Several other species of *Arctia* which have been recorded, are now receiving special study and will be reported on later.
- Phobetrus pithecius*, A. and S. Mt. St. Hilaire, Q. (Stevenson).
- Euproctis chrysorrhæa*, L. The first Canadian specimen of the Brown-tailed Moth, which has been so destructive around Boston, Mass. was taken at St. John, N. B., by Mr. McIntosh this year. No others were seen.
- Datana contracta*, Walk. Trenton, 10 to 24 July, (Evans).
- Gluphisia severa*, H. Ed. "Have had a single specimen in my collection for years." Cartwright, June, (Heath). Kaslo, (Cockle).
- Hepialus montanus*, Stretch. Dr. Barnes reports this as common at Vancouver and Victoria.

- Hepiatus mustelinus*, Pack. St. John, common, (McIntosh). Anticosti, (Schmitt).
Ottawa, (Young, Gibson).
- Bombycia improvisa*, H. Ed. Victoria, 19th October, (Hanham). 26th October, (Anderson).
- Bombycia semicircularis*, Grt. New Westminster, (Jones), Victoria, 19th June, (Hanham).
- Bombycia Tearlii*, H. Ed. New Westminster, (Jones).
- Feralia major*, Smith. Ottawa, 20th April, (Fletcher). Toronto, (Gibson).
- Momophana Comstocki*, Grt. Victoria, 16th April, (Anderson). New Westminster, (Jones).
- Acronycta hesperida*, Smith. Kaslo, Eggs sent 4th July. (Cockle). Bred specimen 28th June, Vancouver, (Harvey).
- Acronycta hesitata*, Grt. Meech Lake, Que., 2nd June, (Young).
- Acronycta perdita*, Grt. Victoria, (Anderson).
- Acronycta Canadensis*, Sm. Larva on poplar; pupa Aug., 1901; imago 27th May, 1902. Kalso, (Cockle).
- Hytonix sensilis*, Grt. Meech Lake, Que., 7th June, (Young)
- Semiophora climata*, Gn. St. John, 24th July, (McIntosh).
- Semiophora Youngii*, Sm. Mer Bleue, Ottawa, 18th Sept. (Young, Gibson).
- Agrotis genicula*, G. & R. Meech Lake, Que., 9th June, (Young).
- Noctua jucunda*, Walk. Meech Lake, Que., 26th July, (Young).
- Noctua rubifera*, Grt. Meech Lake, 25th July, (Young).
- Noctua atricincta*, Beulah, Man., (Dennis).
- Porosagrotis mimallonis*, Grt. Meech Lake, 31st July, (Young).
- Carneades fumalis*, Grt. Meech Lake, 3rd Sept., (Young).
- Carneades relleripennis*, Grt. Meech Lake, 25th Aug., (Young).
- Carneades reuda*, Strck. Victoria, 1st Sept., (Anderson).
- Carneades pleuritica*, Grt. Aweme, Man., (Criddle).
- Carneades titubatis*. Victoria, 1st Sept., (Anderson).
- Carneades vetusta*, Walk. Victoria, (Hanham).
- Carneades rulpina*, Sm. Kalso, 27th July, (Cockle).
- Carneades Ridingsiana*, Grt. Kalso, 22nd Aug., (Cockle). Beulah, (Dennis).
- Mamestra circumvadis*, Sm. Jl. N. Y. Ent. Soc., 1902, p. 42. Aweme, (Criddle). Cartwright, (Heath).
- Mamestra obscura*, Sm. Cartwright, (Heath).
- Mamestra anguina*, Grt. Cartwright. Several; have previously only seen an odd one at long intervals, (Heath).
- Mamestra rectilinea*, Sm. Victoria, Aug., 23, (Anderson).
- Scotogramma sedilis*, Sm. Kaslo B. C., (Cockle). Very rare.
- Scotogramma inconcinna*, Sm. Kaslo, (Cockle).
- Hadena nigrior*, Sm. Meech Lake, 14th June, (Young).
- Hadena claudens*, Walk. Victoria, (Anderson).
- Hadena cariosa*, Grt. Meech Lake, 16th July, (Young).
- Hadena plutonia*, Grt. "At sugar", Cartwright, 12th July, (Heath).
- Hadena algens*, Sm. Meech Lake, 12th Sept., (Young).
- Hadena binotata*, Walk. Victoria, B. C., July, (Harvey).
- Oncocnemis Barnesii*, Sm. Kaslo, B. C., (Cockle). This was described from the unique type in Dr. Barnes's collection, taken in Yellowstone Park.
- Oncocnemis riparia*, Morr. Aweme, (Criddle).
- Macronoctua ovista*, Grt. Two specimens reared from larvæ feeding in and on stems of *Iris versicolor*, L., emerged 3rd Sept., Montreal, (Winn). Belleville, 1880, (Evans). Ottawa, 29th Sept., 1902, (Fletcher).

Hydræcia inquesita, G. & R. Two specimens, 12th and 25th Sept., Ottawa, (Young).
Trenton, (Evans).

Hydræcia cerussata, Grt. Ottawa, two specimens, 8th Sept., (Fletcher, Young).

Hydræcia marginidens, Gn. Larva common in stems of *Cicuta*, near Montreal West, end of July, (Winn).

Several other species of *Hydræcia* have been reported, but there is so much confusion in the genus that for the present they are held over. Those mentioned above have been identified by Mr. Henry Bird.

Arzama diffusa, Grt. Trenton, (Evans).

Arzama densa, Walk. Vancouver, (Harvey).

Taniocampa oviduca, Grt. Meech Lake, Que., 26th May, (Young).

Taniocampa culea, Gn. Meech Lake, Que., 31st May, (Young).

Taniocampa subterminata, Sm. Vancouver, abundant, (T. Wilson, Bush and Harvey).

Perigrapha subtransparens, Grt. 3 specimens, April, Vancouver, (Harvey).

Scopelosoma devia, Grt. Ottawa, 22nd April, (Young).

Ipimorpha pleonectusa, Grt. "A leaf roller on poplar," Kaslo, (Cockle). Victoria, (Anderson).

Xylina Baileyi, Grt. Wellington, (Taylor).

Xylina gausapata, Grt. Victoria, 21st Oct., (Anderson). This is a very rare species.

Xylina Thaxteri, Grt. New Westminster, (Jones).

Xylina holocinerea, Sm. Wellington, April, (Taylor). New Westminster, (Jones).

Xylina fagina, Morr. 16th April, Ottawa, (Young). Wellington, 17th April, (Taylor).
New Westminster (Jones)

Xylina ferrealis, Grt. Sept., Ottawa, (Gibson).

Plusia formosa, Grt. St. John, July 24, 2 specimens. (McIntosh).

Plusia mappa, G. & R. Hatzic, B. C., July, (R. Draper). Victoria, (Taylor). St. John, N. B., Not uncommon. (McIntosh).

Plusia metallica, Grt. = *scapularis*, H. Ed., and *lenzii*, Behr. Kaslo, (Cockle). Wellington, (Taylor). Victoria, July 7, (Anderson).

Plusia rectangula, Kirby = *mortuorum*, Gn. St. John, common, (McIntosh). Montreal, 5 sp., 19th Aug., (Norris). Wellington, (Taylor). Victoria, (Anderson).

Plusia diasema, Dalm. A few specimens of this fine species have been taken at Kaslo by Mr. Cockle in August.

Plusia alias, Ottol. This species has in the past been confused with *rectangula*, which it resembles, but has less silver. It has also been commonly labelled *n-aureum*, but has been recently characterized by Mr. Ottolengui as a species under the name of *alias*. St. John, common, (McIntosh).

Plusia excelsa, Ottol. Kaslo, July 31, (Cockle).

Plusia variana, Ottol. St. John, (McIntosh).

Plusia rubidus, Ottol. St. John, (McIntosh).

Melaporphyria ononis, Fab. Cartwright, (Heath). "Have not seen it for many years."
A day-flyer. July, Lauder, Man., (Sandercock). Beulah, (Dennis).

Copablepharon absidum, Har. Five specimens of this striking moth were taken by Mr. Criddle at Aweme, on July 11; three of these have a subterminal row of very fine dark brown dashes across the primaries.

Heliothis phlogophagus, G. & R. Beulah, Man., (Dennis).

Anarta melanopa, Thunb. Mount Cheam, B. C., 14th Aug., (Bush and Fletcher).

Annaphila diva, Grt. Vancouver, June, (Bush).

Catocala hermia, H. Ed. Hatzic, Aug., (Draper).

Catocala elda, Behrens. Hatzic, B. C., (Draper).

Pseudolimacodes littera, Gn. Two specimens of this pretty little moth have been taken at Ottawa in June. (Gibson, Young).

Erebis odora, L. Vancouver; found in an electric light, (Bush). We now have records of this fine immigrant right across Canada, from ocean to ocean. It is very remarkable if the species does not breed in Canada.

Capis curvata, Grt. At light, Cartwright, (Heath).

Brephos infans, Moeschl. This interesting little moth has now been recorded from the Atlantic to the Pacific. St. John, (McIntosh). Montreal, 25th March, (Norris). Ottawa, April, (Fletcher). Toronto, April, (Gibson). Aweme, Man., (Criddle). High River, Alta., (T. Baird). Banff, Alta., (Sanson). Victoria, B. C., (Anderson). Nanaimo and Wellington, B. C., (Taylor).

COLEOPTERA:

Cicindela montana, Lee.

Cicindela formosa, Say, var. *Manitoba*, Leng.

Cicindela scutellaris, Say, var. *Lecontei*, Hald.

Cicindela venusta, Lec.

All of the above 4 species have been taken at Aweme by Mr. Criddle.

Cychrus viduus, Dej. Several specimens of this handsome beetle are recorded as captured in 1902. St. John, (McIntosh). Mount St. Hilaire, Q., June 11; two other specimens were taken at the same place three years ago, (Chagnon). Mt. St. Hilaire, Q. July 1. (Stevenson).

Blethisa Julii, Lec. Specimens were taken at Quebec some years ago, (Hanham).

Blethisa quadricollis, Hald. Hull, Q., and Buckingham, Q., (Harrington).

Blethisa multipunctata, L. Two specimens under dead leaves, Montreal, Sept., (Chagnon).

Blethisa Oregonensis, Lec. Victoria, (Taylor).

Calathus advena, Lec. St. John, (McIntosh).

Galerita janus, Fab., Rigaud, May 25, (Stevenson).

Platynus anchomenoides, Rand. St. John, (McIntosh).

Platynus excavatus, Dej. St. John, (McIntosh).

Platynus 4-punctatus, Dej. St. John, (McIntosh).

Platynus nigriceps, Lec. Rare; Toronto, May 15, (Crew). Nepigon, (Fletcher).

Callida punctata, Lec. Montreal, July 11, on flowers, (Chagnon).

Brachylobus lithophilus, Say. Toronto, rare, May 15, (Crew).

Harpalus pleuriticus, Lec. St. John, (McIntosh.)

Harpalus laticeps, Lec. St. John, (McIntosh).

Spharidium scarabaeoides, L. Toronto, (Crew). This interesting beetle first appeared at Toronto about three years ago, and is evidently spreading through Canada.

Cercyon indistinctum, Horn. Trenton, (Evans).

Pselaphus Erichsonii, Lec. Toronto, (Crew). Ottawa, (Harrington).

Gymnusa brevicollis, Grav. Toronto, rare, (Crew).

Quedius vernix, Lec. Wilcox Lake, north of Toronto, under a stump, March 28; two specimens, (Crew).

Tachyporus jocosus, Say. St. John, May 1, (McIntosh).

Coccinella monticola, Muls. St. John, (McIntosh).

Aphorista lata, Lec. Vernon, (Venables). Kaslo, (Cockle).

Hister semiruber, Casey. Aweme, Man. (Criddle.) Blackfalds, Alta. (Gregson).

Hister coarctatus, Lec. Trenton, (Evans).

- Ips obtusus*, Say. In running sap on an oak tree, Toronto, Sept. 7th, very rare. (Crew).
Prionocyphon discoideus, Say. June 28, St. John, (McIntosh).
Cyphon concinnus, Lec. Vernon, (Venables).
Calochromus dimidiata, Lec. Osoyoos, (C. de B. Green).
Corymbites medianus, Germ. "Trout Creek," Toronto, June 5, (Crew).
Corymbites hamatus, Say. "Trout Creek," Toronto, June 5, rare, (Crew).
Chrysophana placida, Lec. Vernon, (Venables).
Malachius ceneus, L. St. John's, Que. June 9, (Chagnon).
Xestobium elegans, Horn. Anticosti, (Schmitt).
Cupes capitata, Fab. Toronto, August 15, rare, (Crew).
Hylecatus lugubris, Say. A pair of this rare and interesting Lymexilid was taken this season on an old maple stump at Rigaud, Que., by Rev. Father Desrochers. He had also previously taken two females at the same place. The female differs from the male in having the head and thorax reddish orange.
Canthon simplex, Lec. Macleod, Alta., June 20, (Fletcher).
Xyloryctes satyrus, Fab. Two specimens of this fine scarab were taken at Trenton, 6 June (Evans). Ottawa, (Fletcher, Harrington).
Tylonotus bimaculatus, Hald. Trenton, 27 August, at light, had only two specimens before, (Evans).
Obrium rubrum, Newm. Trenton, (Evans). This rare little longicorn is occasionally found at Ottawa on hickories.
Neoclytus caprea, Say. St. John, (McIntosh).
Desmocerus cribripennis, Horn. Vancouver, May, (Harvey). Vernon, (Venables).
Toxotus obtusus, Lec. Vernon, (Venables).
Anthophylax mirificus, Bland. One male, Kaslo, (Cockle).
Acmaeops bivittata, Say. Calgary, (Fletcher).
Acmaeops atra, Lec. Vernon, (Venables).
Acmaeops subpilosa, Lec. Vernon, (Venables).
Acmaeops longicornis, Kirby, Vernon, (Venables).
Gaurotes Cressoni, Bland. Vernon, (Venables).
Bellamira scalaris, Say. Ottawa, (Fletcher).
Leptura sanguinea, Lec. St. John, (McIntosh).
Leptura lineola, Say. Beaten from dogwood blossoms, "Trout Creek," Toronto, June 9, (Crew).
Leptura vagans, Oliv. With the above, (Crew).
Leptura vexatrix, Mann. Blackfalds, Alta. June 3, (Gregson).
Leptura tibialis, Lec. Anticosti, (Schmitt).
Encyclops caeruleus, Say. "Trout Creek," Toronto, (Crew).
Goes debilis, Lec. "Trout Creek," Toronto, June 9, (Crew).
Goes oculata, Lec. with the above, rare, (Crew).
Eupogonius vestitus, Say. Also with the above, rare, (Crew).
Chrysochus cobaltinus, Lec. Vernon, (Venables).
Monoxia puncticollis, Say.

Many specimens, very variable. Halifax, N.S., (Evans).

Microrhopala excavata, Oliv. Say. St. John, July 24, (McIntosh).

Cassida viridis, L. This European tortoise beetle has evidently established itself in Canada.

Dr. Fyles has referred to it in the Canadian Entomologist XXXIV., p. 273, and his note has been commented upon by Rev. Elias Roy, in Le Naturaliste Canadien, 1902, p. 145, as *C. thoracica*, Illig. Dr. Fyles has recently referred his specimens to 7 EN.

the British Museum and has received the following report from Mr. C. O. Waterhouse: "I have carefully examined the *Cassida* you send, and I am sure it is our common thistle species *C. viridis*." Mr. Winn reports that it was common in all stages at Levis, Que., on Aug. 21, feeding upon dock and thistle.

Mordella serval, Say. St. John, July 24, (McIntosh).

Mordella borealis, Lec. St. John, (McIntosh). Both this and *M. serval* are rare species.

Corphyra inconspicua, Horn. A specimen of this Californian species was taken at Vernon by Mr. Venables.

Calopus aspersus, Lec. Vernon, (Venables).

Rhinomacer pilosus, Lec. St. John, June 9, McIntosh).

Myodites scaber, Lec. Vernon, (Venables).

Myodites zeschii, Lec. St. John, (McIntosh). Abundant in the beginning of July on the buds of *Solidago* at Nepigon, (Fletcher).

Peritelopsis globiventris, Lec. Vernon, (Venables).

Geoderces melanothrix, Kirby. St. John, June 23, (McIntosh).

Phytonomus punctatus, Fab. Victoria, July, (Hanham). This Clover Weevil has apparently spread to the Pacific province and is there in considerable numbers. Mr. Hanham writes that during the last week in July he took 100 specimens on his tennis lawn from pieces of board put there for the purpose of trapping insects, and he could collect specimens at any time during the season by the same method. He saw no sign of the fungous disease which usually controls this insect in the east.

Gryphidius equiseti, Fab. St. John, July 8, (McIntosh).

Lixellus filiformis, Lec. and *Lixus rubellus*, Rand. Appear to be quite common on plants growing at the edge of a lake in Mount St. Hilaire, Que. The former is often found on weeds emerging only a few inches from the water, and growing sometimes forty or fifty feet from the shore. Some of the specimens are covered with a hard coat of mud. *L. rubellus*, Rand., is found on plants growing close to the water's edge, (Chagnon).

ORTHOPTERA.

Mr. E. M. Walker, of Toronto, has continued his studies of the Canadian locusts and their allies, and has published some of his results in the *Canadian Entomologist*, but has been prevented this year by other work from preparing a report upon recent captures. He however sends the following notes on species of special interest:

Melanoplus Bruneri, Scudd., a single male was taken at Dwight, Northern Muskoka, 2nd September. This is of special interest, as it is a western species known only previously from Alberta and some of the western states. (Walker.)

Xiphidium saltans, Scudd., another western insect, which was taken in considerable numbers in a certain part of High Park, Toronto, during August and September. They occurred in bunches of rather long grass on sandy soil, and were in company with *Melanoplus Dawsoni*, Scudd., among other Orthoptera. Both *X. saltans* and *M. Dawsoni* are species belonging to the western prairies and their occurrence together so far east is of some interest. (Walker.)

ODONATA.

A few workers have collected Dragon-flies during 1902 and more extensive work is planned for next season. Several observers have reported the extraordinary numbers of these insects seen on the prairies during the past season. Mr. Harvey, of Vancouver, Mr. E. M. Walker, of Toronto, and Mr. T. J. McLaughlin, of Ottawa, have sent in short lists of species. These will be reported upon in the next Entomological Record.

HYMENOPTERA.

BY W. HAGUE HARRINGTON, OTTAWA.

Collectors are being gradually attracted to this important order, and several nice lots have been sent in for determination. Among those who are now collecting may be mentioned Mr. R. V. Harvey, Vancouver, B.C.; Mr. E. P. Venables, Vernon, B.C.; Mr. A. G. Leavitt, St. John, N.B.; Mr. J. B. A. Leo Leymarie, Montreal, and Dr. Schmitt, Anticosti Island, Que. This number will undoubtedly increase as our members realize how much of interest from the scientific standpoint, and how much of importance from an economic aspect the species of this order possess. The enormous number of species, even in our northern regions, ensures the continual discovery of rare and new forms, thus giving a frequent stimulus to the collector and student of them. Indeed, the trouble at present is not so much to obtain new material as to determine and utilize what is received. This difficulty will gradually disappear as specimens become named and arranged in a greater number of accessible collections, and as classifications are placed upon a more durable basis and synopses and descriptive monographs are multiplied.

No works dealing specially with Canadian Hymenoptera have, I think, appeared during the year, but the several entomological magazines have contained various articles in which species from Canada are described or mentioned. Ashmead has continued in the *Canadian Entomologist* his valuable papers on the "Classification of the Fossorial, Predaceous and Parasitic Wasps, or the Super-family Vespoidea," and in the November number of the *Canadian Entomologist* the family Trigonalidae is reached and tabulated. An annotated list of the Ottawa species of the Super-family Sphegoidea was published in the *Ottawa Naturalist*, vol. xv. p. 215, January 1902 (Harrington). Though not treating of Canadian specimens, the "Papers from the Harriman Alaska Expedition" are of extreme interest and value, as a large proportion of the insects catalogued and described are certain to be distributed through our adjacent territories, some indeed being transcontinental in their distribution. The entomologist to the expedition was Prof. Trevor Kincaid, and the extent of his collections testify to his ability and assiduity. He has discussed the Tenthredinoidea in paper No. vii., enumerating over fifty species, of which more than one-half are new. He has also, in paper No. xiv., dealt with the Sphegoidea and Vespoidea, of which only nine species occurred, two of which are new. The Formicoidea yielded only six species which were considered by Pergande. All the rest of the Hymenoptera were placed in Ashmead's hands and proved very rich in new species. His report, paper No. xxviii., contains not only the descriptions of these but is a complete catalogue of all species now known from Alaska. These number in all 335 species of which he describes 201 as new. This will give some idea of the yet unknown riches of our own northern fauna. An interesting paper has been received from Dr. Kiaer of Tromsø Museum, Norway—"Die arktischen Tenthrediniden"—a catalogue of the Arctic sawflies of Europe, Asia and America, which enumerates a number of Canadian species.

The material amassed during the past season by our various collectors is as yet largely undetermined; even the Ottawa species showing a very large proportion unnamed. The following list, therefore, does not pretend to give in any measure a complete record, but mentions only a few of the species which appear of more than ordinary interest:

Bombus frigidus, Smith. This is an Arctic species recorded from Great Slave Lake and the Yukon River. Females and workers received from Anticosti Island (Schmitt).

Bombus juxtus, Cress. From Goldstream, B.C. (Harvey).

Bombus mixtuosus, Ashm. One of the new species described from Alaska. Specimens from Vancouver (Harvey), Rocky Mountains, Laggan? (Bean) and Banff, Alta., (Fletcher). A worker minor from Nepigon (Fletcher) may also possibly belong to this species.

Bombomelecta thoracica, Cress. Vernon, B.C. (Venables).

Perdita 8-maculata, Say. A pretty little species from St. John, N.B., (Leavitt).

Spilomeni pusilla, Say. This little species, the smallest of our Sphegoidea, was omitted from the recently published list of Ottawa species. The single example taken had been placed with some unexamined proctotrypids, some forms of which it superficially resembles. Ottawa (Harrington).

Thyreopus latipes, Smith. Not known to me before from the Pacific coast. Two males from Victoria (Harvey), and one from St. John, N.B. (Leavitt.)

Odynerus arvensis, Sauss. Male from Trenton, Ont. (Evans).

Polybia flavitarsis, Sauss. This seems to be a common species in Vancouver Island. Specimens received from Victoria (Taylor and Harvey).

Ibalia maculipennis, Hald. This interesting cynipid has been taken at Montreal (Chagnon).

Ichneumon viola, Cress. A fine distinct species from Goldstream, B.C. (Harvey).

Thalessa Nortoni, Cress. This large ichneumon-fly seems to be widely distributed but rare, and has hitherto been vainly sought at Ottawa. From Levis, Que. (Fyles), Victoria, B.C. (Harvey), Mount Ché-am, Fraser River, B.C. (Fletcher).

Dyseidopus Vancouverensis, Bradley. A new species described in *Entomological News*, vol. xiii., p. 307, December, 1902, from Vancouver, B.C. (Harvey).

Odontomerus bicolor, Cress. Victoria, B.C. (Harvey).

Metopius pollinctorius, Say. A large and striking tryphonid, Ottawa (Harrington).

Tremex columba, Linn. A common eastern species, Vernon, B.C. (Venables).

Calamenta (Cephus) trimaculatus, Say. Seems to be a rare species. Trenton (Evans).

Lyda atrata, Cress. One male only has been taken near Ottawa (Evans).

Bactrocera excavatus, Nort. Also a rare form from Trenton (Evans).

Schizoceros plumiger, Klug. Taken for first time in Canada at Deloraine, Man. (Fletcher).

Hylotoma rubiginosa, Beauv. Also an addition to our saw-flies. Nepigon, Ont. (Fletcher).

Blenocampa inhabilis, Nort. St. John's, Que. (Chagnon), Halifax, N.S. (Evans).

Anoplonyx Canadensis, Hrgtn. A new species described from Ottawa (Harrington).

Trichiocampa gregarius, Dyar. St. John's, Que. (Chagnon), Ottawa (Harrington).

Pteronix magus, Marlatt. This species was described from Canada, but no locality was given. A fine female was taken at Trenton, Ont. (Evans).

Taxonius nigrisoma, Nort. This common species has been found to have the habit of boring into apples before pupating (Fletcher).

Pachyprotasis nigrofasciata, Esch. Taken by Kincaid in Alaska and found by him to be identical with *Macrophya omega*, Nort. A species with a wide distribution in the United States and Canada. Its records include the Pacific coast, Saskatchewan and Labrador. Now received from Anticosti Island, Que. (Schmitt).

Macrophya fuliginea, Nort. This species seems rare and local. Montreal (Ouellet).

Macrophya albilabris, Hrgtn. Male from Montreal (Ouellet). Female not known.

Macrophya Oregona, Cress. First occurrence in Canada. Vancouver, B.C. (Harvey).

Homæoneura 14-punctata, Nort. Occurs rarely at Ottawa (Harrington). Montreal, Ouellet).

Tenthredo nigrisoma, Hrgtn. Inhabits British Columbia and Alaska. Vancouver (Harvey).

Tenthredo eximia, Nort. At Ottawa, a rare species. Montreal (Ouellet).

DIPTERA.

BY W. HAGUE HARRINGTON, OTTAWA.

Scant attention is given to the members of this order by our collectors, and no papers have been published recently regarding our flies except that of Mr. Chagnon upon the Syrphidae of the Province of Quebec which first appeared in the *Naturaliste Canadien* for 1901, but is now issued as a pamphlet of 75 pages in which he describes 33 genera and 71 species. Mr. Chagnon seems to be the only Canadian collector specially studying diptera. A few are taken occasionally by other members, but in most collections these insects are probably unnamed. Lists have been received from Mr. Harvey, of Vancouver, and Mr. McIntosh, of St. John, N. B. These will be reported at a latter date. Dr. Schmitt, of Anticosti Island, has forwarded some from that unworked locality, but many of the species have yet to be determined. Since the discovery of the carrying of fever germs by mosquitoes, special attention has been directed to these forms in America and elsewhere, and many new species have been described, and much has been learned of the larval habits of different species which was formerly unknown. The wave of investigation has however been but slightly felt in Canada.

The following eleven species of diptera have been added to our fauna at intervals ;

Sciophila subcærulea, Coq. n. sp. Proc. U.S. Nat. Mus. Vol. xxiii, p. 595—Canada, New Hampshire and Pennsylvania. Ottawa (Harrington).

Dryomyza aristalis, Coq. n. sp. Proc. U.S. Nat. Mus. Vol. xxiii, p. 617—Ottawa, Canada (Harrington).

Culex Fletcheri, Coq. n. sp. Proc. U.S. Nat. Mus. Vol. xxv, p. 84—Alberta and Assiniboia (Fletcher).

Simulium fulvum, Coq. n. sp. Proc. U.S. Nat. Mus., Vol. xxv, p. 96—Montana, Colorado, Alaska and British Columbia. Calgary, Medicine Hat, N. W. T. and Mt. Cheam, B. C. (Fletcher). Laggan, B. C. (Wickham).

Oestrophasia calva, Coq. n. sp. Proc. U.S. Nat. Mus., Vol. xxv, p. 109—Arizona, Canada. Ottawa (Harrington).

Exoristoides Harringtoni, Coq. n. sp. Proc. U.S. Nat. Mus. Vol. xxv, p. 110—Ottawa (Harrington).

Mydaea flavicornis, Coq. n. sp. Proc. U.S. Nat. Mus. Vol. xxv, p. 123. Missouri, Canada. Rouville, Q. (Chagnon).

Tephronota Canadensis, Johnson, n. sp. Ent. News. Vol. xiii, p. 144—Rigaud, Que. (Chagnon).

Psilocephala grandis, Johnson, n. sp. Can. Ent. Vol. xxxiv, p. 241—Rouville, Que. (Chagnon).

Pyrgota Chagnoni, Johnson, n. sp. Can. Ent. Vol. xxxii, p. 246—Montreal. (Chagnon).

Tipula decora, Doane, n. sp. Journ. N.Y. Ent. Soc. Vol. ix, p. 125—Montreal (Chagnon).

Mr. Chagnon writes : My most important capture among the Syrphidae is a specimen of *Merodon equestris*, Fab. This is new to North America and is an interesting addition to our fauna. Mr. McIntosh has also added many new species to the Canadian list, all of which have passed through Mr. Coquillett's hands.

A KEY TO ORCHARD INSECTS.

BY W. LOCHHEAD, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

Signs are not wanting that our fruit growers desire more definite information about the insects commonly met with in the orchards. They want to *know* the insects which they are constantly fighting. They want to *spray intelligently* and with a definite purpose in view, and not by a blind *rule-of-thumb*, as set forth in some spray calendar.

The day is fast approaching when the successful fruit-grower will not dare to neglect the study of insects. He must know, or recognize, the authors of the injuries done to his trees and shrubs, if he ever hopes to get the largest returns for his investment.

In the following *Key to Orchard Insects* an attempt is made to group the insects according to (1) the host-plant attacked; (2) the particular part or parts of the host-plant attacked; (3) the character of the injuries; and (4) in some instances, the most peculiar characteristic habits. Insects are known by their work. Every insect has its own peculiar mode of working, and when the injurious insect is once recognized and its habits known, it is usually not difficult to follow a line of treatment which will be successful.

Remedies are not given here. They may be found in the *Spray Calendar*, (Bulletin 122), published by the Department of Agriculture, Toronto.

From the stand-point of the fruit-grower, the *mouth-parts* of insects are the most important portions of their anatomy. Consequently, a special study should be made of these parts. The young and adults of beetles, grasshoppers, and crickets have *biting* mouth-parts, hence they can usually be readily killed by the application of Paris Green, or some other poisonous substance to their food. The adults of butterflies and moths have *sucking* mouth-parts, hence cannot be killed by poisons. These, however, are not usually injurious. The young forms of these, known as caterpillars, have *biting* mouth-parts, hence they can be poisoned. Both the young and adult forms of bugs and plant lice have *sucking* mouth-parts, hence they must be treated with powders, liquids or gases that kill by contact or suffocation.

It is also of importance that the fruit-grower learn to recognize the larvæ, for they are usually the most injurious stage of insect life. The young of moths and butterflies, usually called *caterpillars*, are in most cases 16-legged, with the exception of the *loopers* which are 10-legged. The *grubs* or *worms* of saw-flies are 20-legged. The young of beetles, or grubs, are usually 6-legged. The maggots of flies, bees and wasps are usually *legless*. The young of grasshoppers, bugs and plant-lice are 6-legged, and resemble more or less the adult forms.

In the preparation of this *Key*, the writer received valuable aid and suggestions from the writings of Dr. A. D. Hopkins, of West Virginia; Prof. L. Bruner, of Nebraska; Dr. W. Saunders, of Ottawa; and Dr. Bethune, of London.

KEY TO APPLE INSECTS.

A. Attacking the Roots:

1. Causing knots or swellings on the smaller roots—bluish-white mouldy lice.

Woolly Aphis (*Schizoneura lanigera*), Fig. 64.

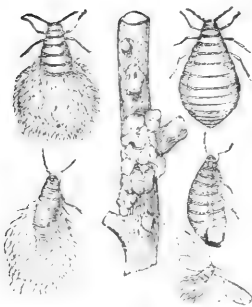


Fig. 64. Woolly Aphis.

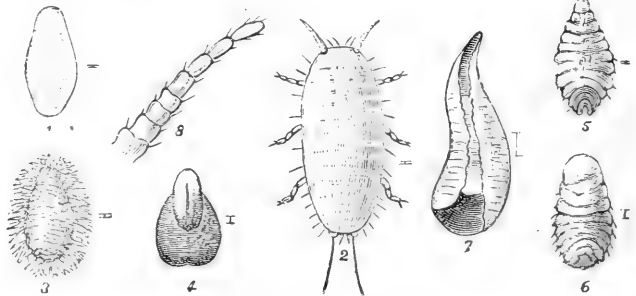


Fig. 65. Oyster-shell Bark-louse.

B. Attacking the Trunk, Branches, and Twigs:

1. Producing longitudinal slits in the bark; eggs under the edges of the slits.

Buffalo Tree-hopper (*Ceresa bubalus*). See Fig. 7.

a. *Fixed to Bark* :

1. Producing an ashy-gray incrustation on the bark ; scales round, and gray and black.

San José scale (*Aspidiotus perniciosus*). See Figs. 4 and 5.

2. Bark rough with mussel-shaped scales.

Oyster-shell Bark-Louse (*Mytilaspis pomorum*). Fig. 65.

3. Bark scurfy with white scales.

Scurfy Bark Louse (*Chionaspis furfurus*). Fig. 66.

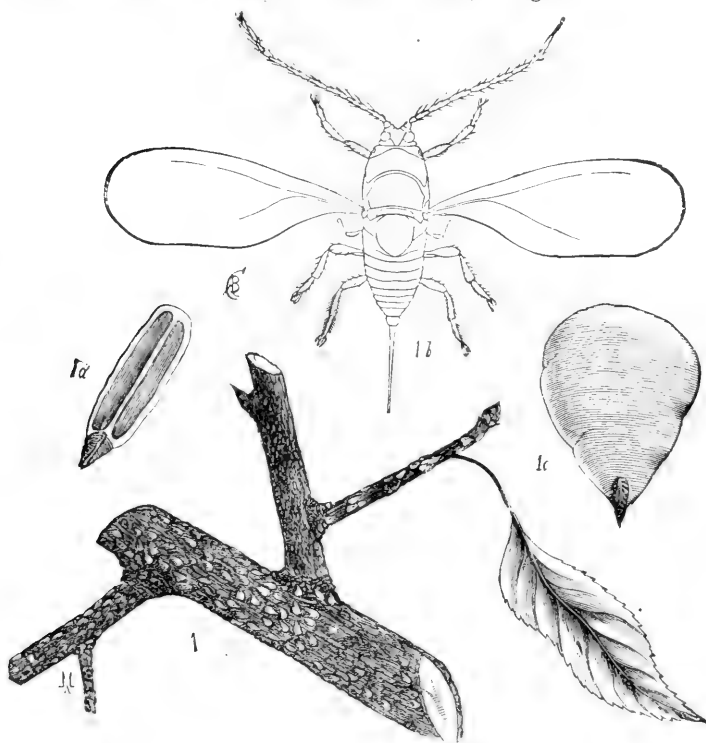


Fig. 66. The Scurfy Bark-louse.

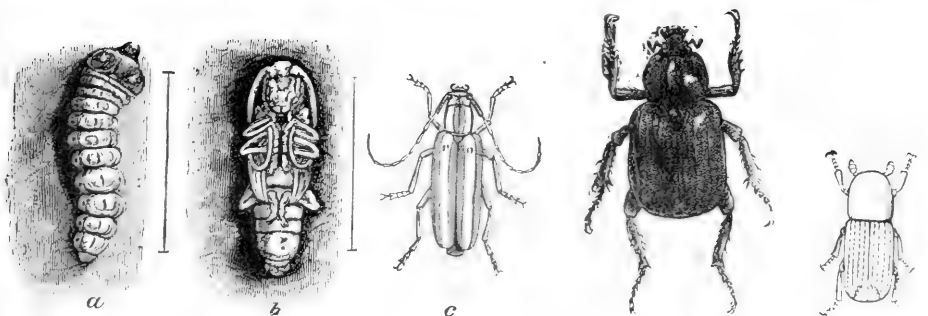


Fig. 67. *Saperda Candida* : (a) borer ; (b) pupa ; (c) beetle.

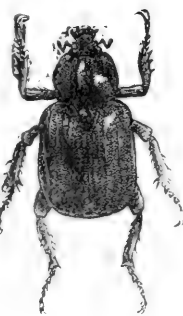


Fig. 68. *Osmoderma scabra*.



Fig. 69. *Scolytus* beetle.

b. *Making Tunnels in the Wood* :

1. Large square-headed legless borer, at or near the ground in tunnels, with saw-dust-like excrement.

Round-Headed Borer (*Saperda candida*). Fig. 67.

2. Large flat-headed, legless borer, in upper trunk in tunnels, with saw-dust-like excrement

Flat-Headed Borer (*Chrysobothris femorata*).

3. Large larva in decaying wood.

Eyed Elater (*Alaus oculatus*) and *Rough Osmoderma* (*Osmoderma scabra*). Fig. 68.

- c. Making tunnels between the Bark and Wood :

1. *Fruit Bark Beetle* (*Scolytus rugulosus*). Figs. 69 and 70.

- d. *White woolly patches on the twigs which are usually scarred :*

Woolly Aphis (*Schizoneura lanigera*).

- e. *Green soft-bodied insects in clusters on young growths, and particularly at ends of twigs, producing distortions :*

Apple Aphis (*Aphis mali*). Fig. 71.

- f. *Snout Beetles gnawing off the bark in patches :*

Imbricated Snout Beetle (*Epicærus imbricatus*). Fig. 72.

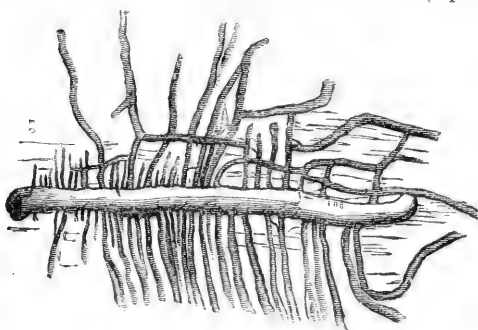


Fig. 70. Tunnels under bark made by *Scolytus* beetle.



Fig. 72. Imbricated Snout-beetle.



Fig. 73. *Caccæcia rosaceana* moth ; wings open and closed.

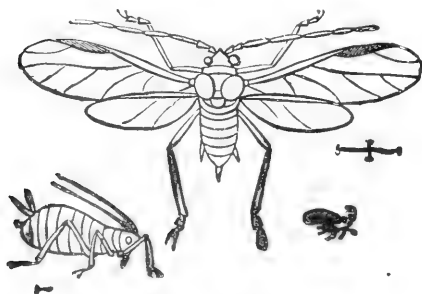


Fig. 71. Apple Aphis.



Fig. 74. *Caccæcia rosaceana* chrysalis and caterpillar, magnified.

C. *Attacking the Buds :*

- a. *Folding together the opening leaves and feeding within.*

Oblique Banded Leaf-Roller (*Caccæcia rosaceana*), Figs. 73 and 74, and *Leaf-Crumpler* (*Phycis indiginella*). Fig. 75.

- b. *Eating the centre of the bud, or tunnelling it.*

Eye Spotted Bud-Moth (*Tmetocera ocellana*).

- c. *Measuring Worms—eating leaves of buds.*

Canker-Worms (*Anisopteryx pometaria*).

- d. *Caterpillars feeding within pistol-shaped cases, and eating irregular holes in the bud leaves. Pistol-Case Bearer* (*Coleophora malivorella*). Fig. 76.

- e. *Caterpillars feeding within cigar-shaped cases, and eating small round holes in the bud leaves. Cigar-Case Bearer* (*Coleophora Fletcherella*).

D. *Attacking the Leaves :*

a. Gregarious caterpillars.

1. Caterpillars protected by webs—

a. Webs in forks of branches in spring.

Tent Caterpillar (*Clisiocampa Americana*). Fig. 77.

b. Webs covering the leaves in summer and early autumn.

Fall Web-Worm (*Hyphantria cunea*).

c. Leaves partly eaten and drawn together by a web.

Palmer Worm (*Ypsolophus pomotellus*).

2. Caterpillars not protected by a web :

a. Clustered on limbs.

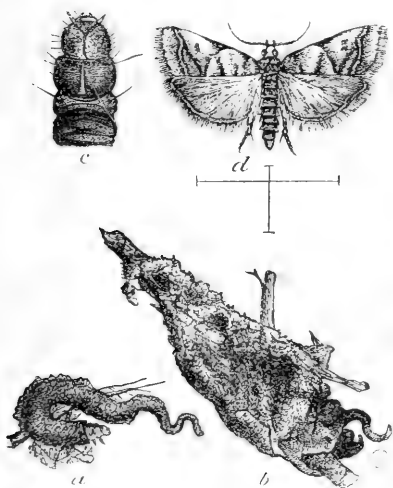
Yellow-necked Caterpillar (*Datana ministra*).b. *Red-Humped Apple-Tree Caterpillar* (*Oedemasia concinna*). Fig. 78.

Fig. 75. Leaf crumpler : (a) and (b) winter cases ; (c) head of caterpillar ; (d) moth.

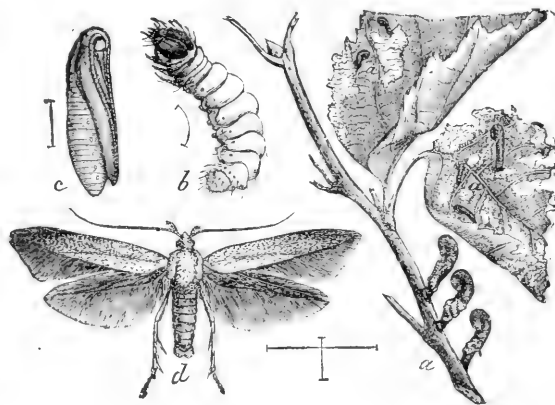


Fig. 76. Pistol-case Bearer : (a) pistol-cases ; (b) caterpillar ; (c) pupa ; (d) moth.

3. Green soft-bodied insects, with sucking mouths.

Plant Lice (*Aphis* spp). Fig. 79.b. *Solitary Caterpillars :*

1. Protected caterpillars—

a. Mining within the leaf, pupa inside of folded leaf.

Apple-leaf Miner (*Tischeria malifoliella*).

b. Mining within the leaf, mature larva and pupa within small oval seed-like bodies.

Resplendent Shield Bearer (*Aspidisca splendoriferella*). Fig. 80.

c. Feeding within pistol-shaped cases which stand out from the leaf.

Pistol-Case Bearer (*Coleophora malivorella*).

d. Feeding within cigar-shaped cases, which stand out from the leaf.

Cigar-Case Bearer (*Coleophora Fletcherella*).

e. Feeding within folded leaves.

Leaf-Roller (*Teras malivorana*) and (*Cacoecia rosaceana*).

f. Feeding within tubes of silk, open at both ends, on epidermis and inner tissues leaving the veinlets.

Bud-Moth (*Tmetocera ocellana*).

g. Feeding on tissues of leaves beneath a silk web.

Apple-leaf Skeletonizer (*Pempelia Hammondi*). Fig. 81.

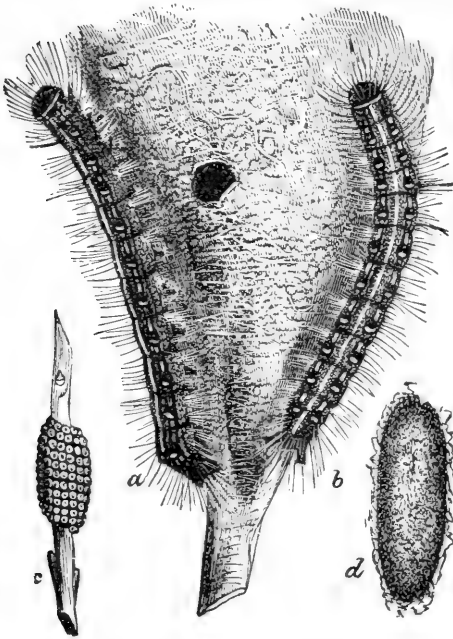


Fig. 77. Caterpillar (a) and (b) on their web; (c) egg-cluster (d) cocoon.

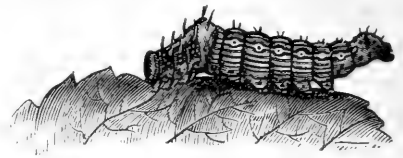


Fig. 78. Red-humped Apple-tree Caterpillar.

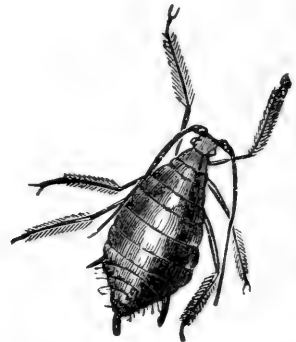


Fig. 79. Aphis, wingless female, immensely magnified.

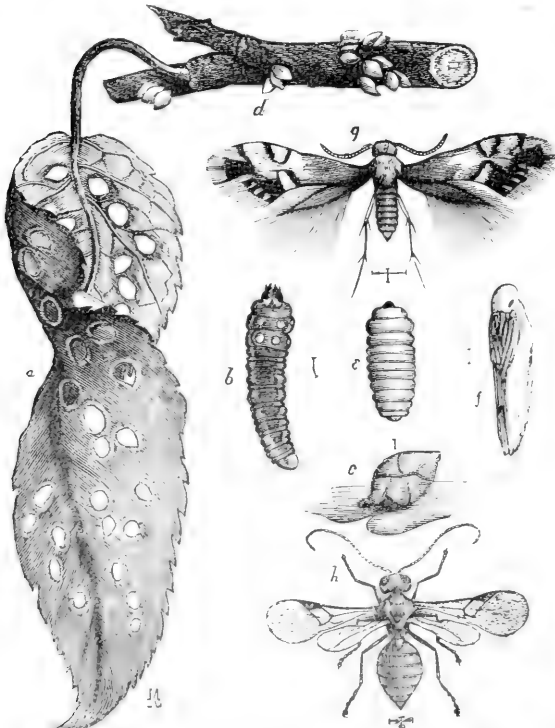


Fig. 80. *Aspidisca splendoriferella*: (a) leaf showing mines; (b) caterpillar; (c) and (d) pupal cases; (e) larva about to change; (f) chrysalis; (g) moth; (h) parasite—all except leaf and twig highly magnified.



Fig. 81. *Pempelia Hammondi*: (a) caterpillar; (b) a segment (c) head, and following segments highly magnified; (d) moth.

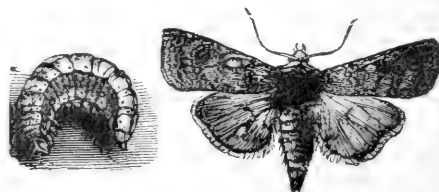
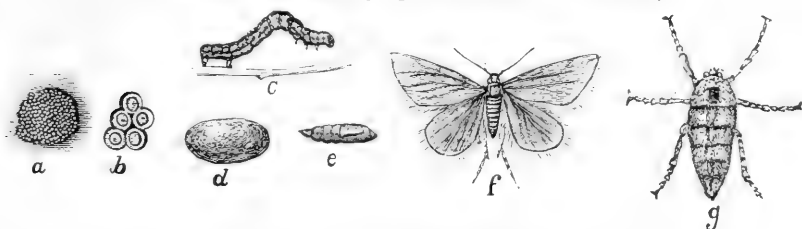


Fig. 82. Cut-worm and Moth.

2. *Unprotected Caterpillars :*

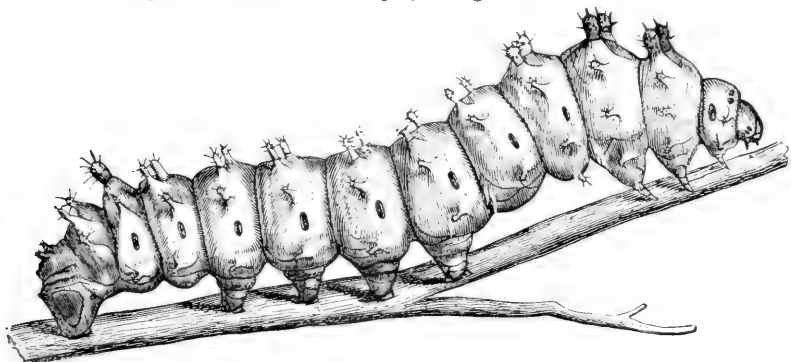
a. Measuring worms, in spring feeding in the day-time.

Canker Worms (*Anisopteryx pometaria* and *A. vernata*). Fig. 83.Fig. 83. Spring Canker-worm (*A. vernata*) : (a) and (b) eggs; (c) caterpillar; (d) cocoon; (e) pupa; (f) male moth; (g) wingless female moth.

b. Sleek 16-legged caterpillars, feeding at night.

Cutworms. Fig. 82.

c. Large, green caterpillar, covered with spiny tubercles.

Cecropia Moth (*Samia cecropia*). Fig. 84.Fig. 84. *Cecropia* caterpillar.

d. Large apple-green caterpillar, with white oblique stripes on sides.

Polyphemus Moth (*Telea polyphemus*).

e. Hairy caterpillar with long black tufts over head and tail.

Tussock Moth (*Orgyia leucostigma*).

f. Large green caterpillar with a reddish-brown horn at tail, and seven oblique stripes on each side.

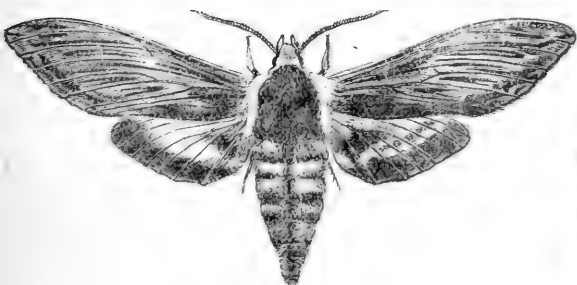
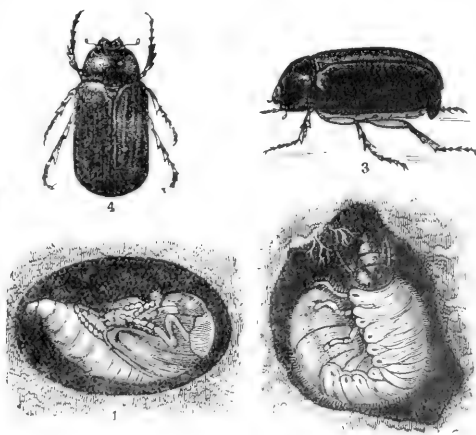
Apple Sphinx (*Sphinx gordius*). Fig. 85.Fig. 85. *Sphinx gordius*.

Fig. 87. May beetles : 1 pupa; 2 grub; 3 & 4 beetles.

g. Small caterpillar, with brown head and yellowish-green body, feeding on leaves.

Apple-Tree Bucculatrix (*Bucculatrix pomifoliella*).

3. *Beetles* :

a. Large brown beetle feeding at night on leaves.

May-beetle (*Lachnosterna fusca*). Fig. 87.

b. Small brown beetles, feeding at night.

Leaf-beetles.

E. *Attacking the Fruit* :

a. *Boring tunnels through the fruit*—

1. Tunnels mostly about the core,—brown excrement often visible at opening at blossom end of apple :

Codling Moth. (*Carpocapsa pomonella*).

2. Tunnels irregular and numerous,—

Apple Maggot. (*Trypeta pomonella*).

b. *Puncturing the Fruit* :

1. Puncturing the fruit and distorting it, a 4-humped beetle,—

Apple Curculio. (*Anthonomus quadrigibbus*).

2. Purplish spots about the circular scales,—

San José scale. (*Aspidiotus perniciosus*).

c. *Eating holes in the Fruit* :

1. Large light-yellow or apple-green caterpillars with a narrow cream-colored stripe along middle of the back,—

Green-fruit Worms. (*Xylina* sp.,).

2. Beetle, yellowish, hairy, $\frac{1}{2}$ inch long,—

Bumble-flower-beetle. (*Euphoria inda*), Fig. 88.



Fig. 88.
Bumble-flour
beetle.

WINTER CONDITIONS OF SOME OF THE APPLE INSECTS.

A. *Attached to trunk, branches, and twigs* :

1. White cocoons $\frac{1}{2}$ to $\frac{3}{4}$ inch long, under loose bark, or burlap, during fall and winter,—

Codling Moth. (*Carpocapsa pomonella*).

2. Bracelets of varnished eggs around twigs in fall and winter,—

Tent Caterpillar. (*Clisiocampa Americana*). Fig. 77 (c).

3. Clusters of cylindrical eggs on branches and twigs in winter,—

Fall Cankerworm. (*Anisopteryx pometaria*).

4. Clusters of round, ribbed eggs,—

Cutworms.

5. Small, oval, shining, black eggs, usually clustered in axils of buds, in crevices, or under bark of upper branches and twigs, in winter,—

Apple Aphis. (*Aphis mali*).



Fig. 89. Leaf-crumpler : Winter
cases covered with withered leaves.

6. Minute pistol-shaped cases on bark in winter,—

Pistol-Case-Bearer. (*Coleophora malivorella*).

7. Minute cigar-shaped cases on bark in winter,—

Cigar-Case-Bearer. (*Coleophora Fletcherella*).

8. Clusters of glistening oval cases on twigs in winter,—

Resplendent-Case-Bearer. (*Aspidisca splendiferella*).

9. Minute silken cocoons at axils of buds, and in crevices of bark,—

Bud Moth. (*Tmetocera ocellana*).

10. Black, crumpled leaves folded together and fastened to the branches during winter—half-grown caterpillars in tortuous tubes within,—

Leaf Crumpler. (*Phycis indiginella*), Fig. 89.

11. Large silken cocoons, 3 inches long firmly attached to twigs during winter,—
Cecropia Moth. (*Samia cecropia*), Fig. 90.

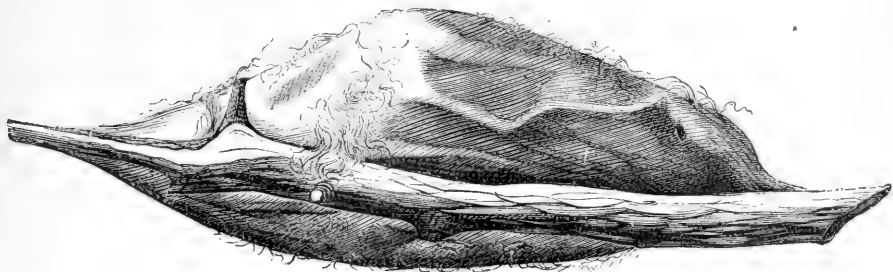


Fig. 90. Cocoon of the *Cecropia* moth.

12. Elongated white, ribbed cocoons, $\frac{1}{3}$ inch long, on twigs during winter,—
Apple Leaf Bucculatrix. (*B. pomifoliella*).
 13. Mussel-shaped scales with whitish eggs underneath in winter,—
Oyster Shell Bark-Louse. (*Mytilaspis pomorum*).
 14. Whitish scales with purple eggs underneath in winter,—
Scurfy Bark-Louse. (*Chionaspis furfurus*).
 15. Minute black circular scales with a depressed ring about a central nipple,—
San José scale. (*Aspidiotus perniciosus*).
 16. A mass of eggs on a cocoon fastened to a dead leaf or a twig in winter,—
Tussock Moth. (*Orgyia leucostigma*).
 17. Eggs in oval slits,—
Buffalo Tree-Hopper. (*Ceresa bubalus*).

A KEY TO PLUM INSECTS.

A. *Attacking the Roots:*

1. Burrowing about the crown of the roots, occasionally in young trees,—
Peach-tree Borer. (*Sannina exitiosa*).

B. *Attacking the Trunk, Branches, and Twigs:*

1. Making tunnels in the wood; saw-dust-like excrement at the mouth of tunnels,—
Flat-headed Borer. (*Chrysobothris femorata*).
 2. Making tunnels in the bark:
Fruit Bark Beetle. (*Scolytus rugulosus*).
 3. Bases of buds perforated, the bark becomes discolored, and the leaves and fruit wither,—
Pear-Blight Beetle. (*Xyleborus pyri*).
 4. *Fixed to Bark:*
 a Flat, or saddle-shaped, or hemispherical dark brown scales. Large scales after mid-summer are brittle and contain only a whitish dust or empty egg-shells. Wintering forms are small and flattish,—
Plum Lecanium. (*Lecanium cerasifex*).
 b Ashy gray appearance of bark of badly infested trees; small gray, or black circular scales,—
San José scale. (*Aspidiotus perniciosus*).
 c Mussel-shaped scales, with whitish eggs underneath in winter,—
Oyster-Shell Bark Louse. (*Mytilaspis pomorum*).
 d. Bark scurfy with white scales, purplish eggs underneath in winter.
Scurfy Bark-Louse (*Chionaspis furfurus*).

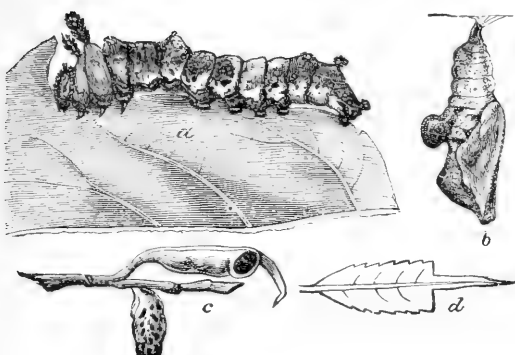
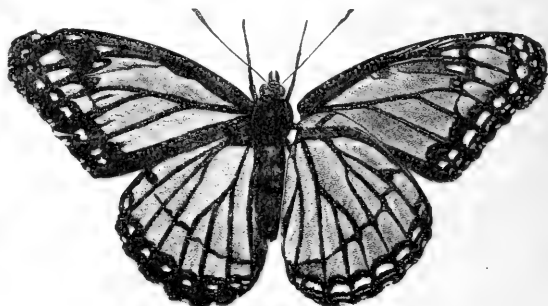
5. Producing longitudinal slits and eventually oval-shaped scars.

Buffalo Tree-Hopper (*Ceresa bubalus*).

C. Attacking the Leaves :

1. Feeding in Colonies :

a. Protected by webs in the forks of branches.

American Tent Caterpillar, (*Clisiocampa Americana*).Fig. 91. *Limenitis disippus*, a. caterpillar; b. chrysalis; c. d. larval case.Fig. 92. *L. disippus* butterfly; colours orange-red and black.

b. Protected by webs covering the leaves.

Fall Web-worm (*Hyphantria cunea*).

c. Not protected by webs, greenish lice with sucking mouths.

Plum Leaf Aphis (*Aphis prunifolii*).

2. Solitary :

a. Measuring worms feeding in the day time and in spring.

Canker worms (*Anisopteryx pometaria*).

Fig. 93. Plum Curculio attacking young fruit; 3 crescent mark; 4 beetle puncturing fruit.

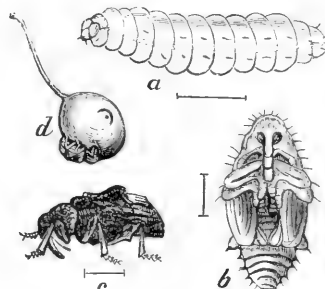


Fig. 94. Plum Curculio: a. larva; b. pupa; c. beetle; d. natural size on young fruit.



Fig. 95. Plum Gouger (magnified).



Fig. 96. Rosechafer.

b. Fat, greasy caterpillars, feeding at night in spring.

Cutworms.

c. Hairy Caterpillar, with long black plumes over head and tail.

Tussock Moth (*Orgyia leucostigma*).

d. Large buzzing beetle.

June Bug (*Lachnosterna fusca*).

- e. Large apple-green caterpillar, with a tail horn, and with seven broad, oblique white stripes along each side.

Plum Tree Sphinx (*Sphinx drupiferarum*).

Other larvae are occasionally found feeding on the leaves of plum :

The Viceroy (*Limenitis disippus*), figs. 91 and 92, Polyphemus and Cecropia.

D. *Attacking the Fruit :*

1. Puncturing and making a crescent-shaped slit in the skin of the young fruit, which soon drops.

Plum Curculio (*Conotrachelus nenuphar*) figs. 93 and 94.

2. Making a round hole in the young fruit.

Plum Gouger (*Coccotorus scutellaris*) Fig. 95.

3. Eating holes in the ripe fruit.

Bumble Flower Beetle (*Euphoria inda*).

4. Eating holes in the half ripe fruit.

Rose Chafer (*Macrodactylus subspinosus*), Fig 96.

KEY TO PEAR INSECTS.

A. *Attacking the Root :*

1. Large yellowish-white borer, with a brown head, boring holes in the roots.

Broad necked Prionus (*Prionus laticollis*), Fig. 97.

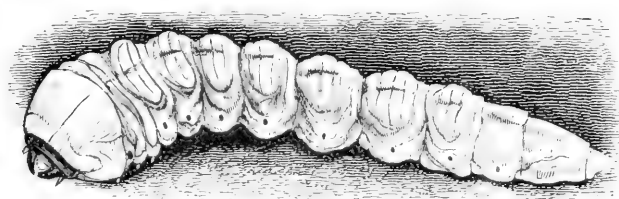


Fig. 97. *Prionus laticollis* grub.

B. *Attacking the Trunk, Branches, and Twigs :*

1. The following insects which attack apple (which see) also attack pear.

Round Headed Apple-Tree Borer *Saperda candida*).

Flat Headed Apple-Tree Borer (*Chrysobothris femorata*

Oyster Shell Bark-Louse (*Mytilaspis pomorum*).

Scurfy Bark-Louse (*Chionaspis furfurus*).

San José Scale (*Aspidiotus perniciosus*).

2. Large soft whitish larvae boring deeply into the wood.

Pigeon Tremex (*Tremex columba*).

3. In the Spring (May) much honey dew at axils of leaves on smaller twigs, and small yellow jumping insects in the sap, foliage yellowish.

Pear-Tree Psylla (*Psylla pyricola*).

4. Perforations at the base of some buds : twigs blighted and leaves withered about mid-summer.

Pear-Blight Beetle (*Xyleborus pyri*).

C. *Attacking the Buds :*

1. The following insects which attack the buds of the apple (which see) also attack those of pear.

Oblique Banded Leaf-Roller (*Cacoecia rosaceana*).

Eye Spotted Bud-Moth (*Tmetocera ocellana*).

Canker Worms (*Anisopteryx pometaria*).

D. *Attacking the Leaves :*

1. A slug-like, slimy larva feeding in July and September on the tissues of the upper side of the leaves.

Pear Tree Slug (*Eriocampa cerasi*).

2. "Reddish blister spots 1-8 inch or more in diameter appearing on leaves in spring, and changing to black corky spots in July, each with a minute opening in it."

Pear Leaf Blister (*Phytoptus pyri*).

2. The following insects which feed on the leaves of apple (which see) also feed on the leaves of pear.

Red-Humped Apple-Tree Caterpillar (*Oedemasia concinna*).

Fall Web-Worm (*Hyphantria cunea*).

Tent Caterpillar (*Clisiocampa*).

Yellow necked Caterpillar (*Datana ministra*).

Canker Worms (*Anisopteryx*).

Bud Moth (*Timetocera ocellana*).

Tussock Moth (*Orgyia leucostigma*).

Cecropia Moth (*Samia cecropia*).

June Beetle (*Lachnosterna fusca*).

Goldsmith Beetle (*Cotalpa lanigera*).

E. *Attacking the Fruit :*

The following insects, which attack the apple and plum (which see) also attack the pear.

Codling Moth (*Carpocapsa pomonella*).

Plum Curculio (*Conotrachelus nenuphar*).

Bumble-Flower Beetle (*Euphoria inda*).

KEY TO CHERRY INSECTS.

A. *Attacking the Root :*

1. Thick whitish grub, with brown head and legs, feeding in decaying roots. Beetle large with powerful mandibles.

Stag-Beetle (*Lucanus dama*), Figs. 98 and 99.

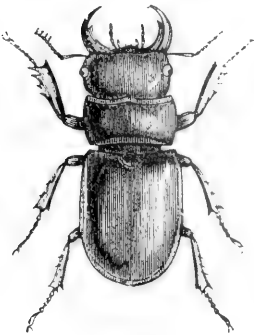


Fig. 98. Stag-beetle.

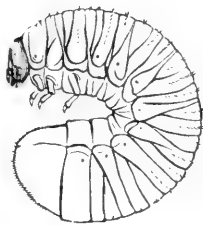


Fig. 99. Stag-beetle, oöcon and larva.



Fig. 100. Apple Twig-borer.

2. Large white fleshy grub, with reddish head, feeding in old roots.

Rough Osmoderma (*Osmoderma scabra*).

B. *Attacking the Trunk, Branches and Twigs :*

1. A snout-beetle, gnawing the twigs and fruit.

Imbricated Snout-Beetle (*Epicaerus imbricatus*).

2. A small beetle boring into the branches just above a bud, and burrowing downwards.
Apple-Twig-Borer (*Amphicercus bicaudatus*), Figs. 100, 101.

3. A flattened grub tunneling in the bark and sap-wood ; beetle bronzy metallic.
Divaricated Buprestis (*Dicerca divaricata*).

4. Large sucking insect with transparent wings inflicting wounds on the smaller limbs, and depositing eggs therein, in August and September.

Dog-day Cicada (*Cicada tibicen*).

5. Small circular scales, black in winter, with a circular depression about a central nipple.

San José scale (*Aspidiotus perniciosus*).

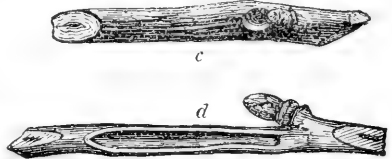


Fig. 101. Twigs showing work of Borer.

Attacking the Leaves :

1. A small beetle feeding on the leaves of red cherry.

Cherry-Leaf Beetle (*Galerucella clavicollis*).

2. A slug, shiny, dark-green, $\frac{1}{2}$ -inch long, feeding on soft tissues leaving the veins.

Pear or Cherry Slug (*Eriocampa cerasi*).

3. Shining black plant-lice, infesting the terminal twigs chiefly, which become distorted and discolored.

Cherry Aphis (*Myzus cerasi*).



Fig. 102.

Callosamia promethea caterpillar.

4. Large bluish-green caterpillar, 2 inches long, with blue warts on each segment, and coral-red ones on 3rd and 4th segments.

Promethea Moth (*Callosamia promethea*),

Fig. 102.

5. Large pale-green spiny caterpillar, striped on each side with white and lilac.

Io Moth (*Hyperchiria Io*).

6. Caterpillars in colonies protected by webs in forks of branches, in spring.

American Tent Caterpillar (*Olisocampa*

Americana), and *Forest Tent Caterpillar*

(not in webs).

7. Caterpillars in colonies not protected by webs covering the leaves in summer and early autumn.

Fall Web-Worm (*Hyphantria cunea*).

And other insects, most of which also attack the leaves of apple.

D. Attacking the Fruit :

1. Making a crescent cut on the cherry ; grub, white and footless, with a brownish horny head, feeding within. *Plum Curculio* (*Conotrachelus nenuphar*).
2. Yellowish white maggots feeding on the pulpy juices near the pit, inducing a rotting. (Cornell Bull. 172).

Cherry Frit Fly (*Rhagoletis cingulata*).

KEY TO PEACH INSECTS.

A. *Attacking the Root and Lower Trunk :*

1. Tunneling in the bark and sap-wood of the root, causing an exudation of gum, which is seen at base of tree mingled with the castings.

Peach Tree Borer (*Sannina exitiosa*).

B. *Attacking the Trunk and Branches :*

1. In early spring, a minute caterpillar bores into the shoots of new leaves, killing the growing terminals.

Peach Twig-Borer (*Anarsia lineatella*).

2. Black hemispherical scales attached to the bark.

Peach Tree Lecanium (*Lecanium persicae*).

3. A beetle eating the buds, and gnawing into the base of the twigs, causing them to break and fall.

New York Weevil (*Ithycerus noveboracensis*),

Fig. 103.

4. Round scales, gray or black, twigs presenting a scurfy appearance.

San José scale (*Aspidiotus perniciosus*).

5. Oval scars and longitudinal slits on back.

Buffalo Tree-Hopper (*Ceresa bubalus*).

C. *Attacking the Leaves :*

1. Plant lice, living in colonies under the leaves, causing them to thicken and curl.

Peach-Tree Aphis (*Myzus persicae*).

2. Minute round scales, usually along the veins.

San José scale (*Aspidiotus perniciosus*).

3. *Caterpillars protected.*

- a. In a tortuous tube.

Leaf Crumpler (*Phycis indiginella*).

- b. In folded leaves.

Oblique banded Leaf-Roller (*Cacoecia rosaceana*).

D. *Attacking the Fruit :*

1. Long legged, yellowish beetles eating holes in half-grown peaches.

Rose-chafer (*Macroductylus subspinosus*).

2. Large yellow hairy beetles, eating holes in ripe peaches.

Bumble-flower Beetle (*Euphoria inda*).

3. Small snout-beetles making a puncture and crescent in the young fruit.

Plum Curculio (*Conotrachelus nenuphar*).

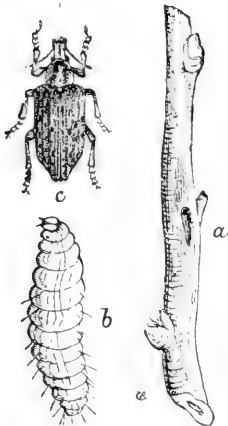


Fig. 103, New York Weevil.
a. Hole in twig made by female.
b. Larva ; c. Beetle.

NOTE ON INSECTS INJURIOUS TO PINES.

By W. HAGUE HARRINGTON, F.R.S.C., OTTAWA.

One of the features of Canada is the great forest belt which covers so large a portion of it, and which yields annually so important a revenue to its inhabitants. This magnificent forest stretches far inland from either ocean and northward forms an uninterrupted zone across the continent. Among the conifers which constitute so large a portion of this great forest area the various pines are prominent, and in the past they have been the chief source of wealth to our lumbermen who have already cut them over large areas. For many years I have seen each

summer the rafts of white pine floating down the Ottawa, while the output of sawn lumber along the river has mounted annually into the hundreds of millions of feet.* On all our eastern rivers the same thing has been seen to a greater or less degree. The constant stream of logs coming down all the tributaries has testified to the richness of the limits upon which they are cut. Not to quantity alone do the pines owe their value, the wood of their splendid trunks is surpassed by that of few other trees in general utility. More than one-third of all our forest exports are the produce of the pines, from the sale of which we derive annually several millions of dollars, in addition to all that is used for home consumption.

So lofty and noble are these splendid lords of the forest that it might be thought that they are secure from all foes except the devastating axe and cruel fire. Yet few of our trees are attacked by so many enemies; small and individually insignificant, but occurring in such abundance sometimes as even to destroy and overthrow the forest giants. To enumerate all these would be beyond the scope and bounds of a paper for this report. One hundred species of insects injurious to pine were mentioned in Bulletin 7 of the U.S. Entomological Commission published in 1881, while in the Fifth Report of the Commission (1890) the number was increased to one hundred and seventy, requiring for their discussion, even briefly, one hundred and thirty-six pages. Mr. A. D. Hopkins has also enumerated many species in his valuable "Report on Investigations to Determine the Cause of Unhealthy Conditions of the Spruce and Pine from 1880-1893;" Bulletin 56 West Virginia Agric. Exp. Sta., April, 1899.

My intention in this note is only to call attention to some of the principal species which I have observed myself as infesting these trees, omitting the lepidoptera, of which various species feed upon the foliage, and also a great many members of other orders which do more or less injury. To the trunk and branches the most serious injuries are done by beetles, which belong chiefly to the families Buprestidae and Cerambycidae. The beetles of the first family are somewhat flattened and elongated, with short antennae, and generally are very hard and with a metallic lustre or bright colours. Some of the most gorgeous of all coleoptera are found among the tropical representatives of this family. The larvae of these beetles are somewhat tadpole-shaped and flattened, and are very destructive to the trees they infest. Fig. 104.

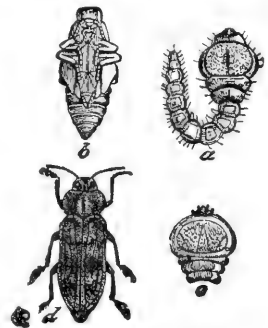


Fig. 104.—Flat-headed Borer (Buprestidae). a and c, grub; b, pupa; d, beetle.



Fig. 105.—*Dicerca divaricata* beetle.

The three largest species upon pine belong to the genus *Chalcophora*, viz., *C. fortis* Lec., *C. Virginiensis* Drury and *C. liberta*, Germ. All these occur in abundance in spring and autumn either upon the trunk and branches, or in the leaf clusters, where they appear to feed upon the buds. *C. fortis* is the largest species, measuring over an inch in length, and is distinguished by its brighter colour and the more sharply elevated lines upon the wing-covers; *virginiensis* is slightly smaller and smoother, and is duller in colour, while *liberta* is generally still smaller and is more ruddy in appearance, although some individuals may be quite dark. Other species of buprestidae are *Dicerca tenebrosa*, Kirby, *D. divaricata* Say (Fig. 105) *Chrysobothris dentipes* Germ., *C. Blanchardi* Horn, *C. Harrisii* Hentz, *C. trimervia* Kirby, *C. scabripennis* L. & G., *Buprestis striata* Fab., *B. maculiventris* Say, *B. consularis*, Gory, and *Melanophila longipes*, Say. On our Pacific coast the genus *Chalcophora* does not appear to be represented, but members of the other genera are common.

The second group of injurious timber beetles is that of the Cerambycidae or long-horned beetles; the antennae, especially in the males, being often much longer than the body. The

* The quantity sawn during 1902 in the Ottawa district has been published as 620,000,000 feet.

larvæ of these beetles are generally not quite so much flattened as are those of the Buprestids, but their habits are much the same. The eggs are placed in the bark in crevices or punctures

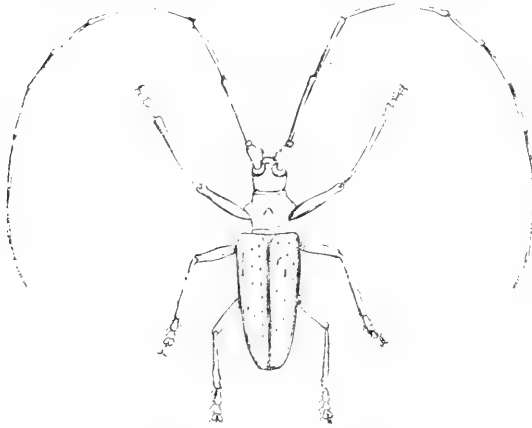


Fig. 106.—*Monohammus confusor*.

made by the female, and the larva when hatched bores at first in the bark, then reaching the outer layers of the wood it feeds upon them, and gradually as it increases in size it works deeper into the solid wood. The largest and one of the commonest of our pine-boring beetles is *Monohammus confusor*, Kirby, a grey beetle with very long antennæ (Fig. 106). Its larva, when full grown, is about an inch and a half long, and is armed with a powerful pair of mandibles with which it eats its way rapidly through the wood. Standing near a pile of infested sawlogs one can distinctly hear the *crunch, crunch*,

of the destroying grubs. This species occurs from the Atlantic to the Pacific and varies little in appearance. Another common species is *M. scutellatus*, Say, (Fig. 107)—a black beetle, with slight white markings which are often nearly rubbed off. It has also a wide distribution, but the western specimens vary slightly in appearance and were described as a separate species (*M. oregonensis* Lec). Other species of the genus are *M. tittillator* Fab., *M. maculosus*, Hald. and *M. marmorator*, Kirby, all found in Canada in greater or less abundance in different localities. These five species often cause considerable loss to our lumbermen, by their depredations upon sawlogs. Logs left in the woods for a year, through breaking up of roads, or lack of water, etc., are often so badly damaged as to greatly lessen their value. This damage can be prevented by removing the bark from the logs in spring, but this means a considerable expense, even when practicable. Other long-horned beetles infesting the pines are *Tragosoma Harrisii*, Lec., *Asemum moestum* Hald. (Fig. 108), *Criocephalus agrestis*, Kirby, *Rhagium lineatum*, Oliv., etc.

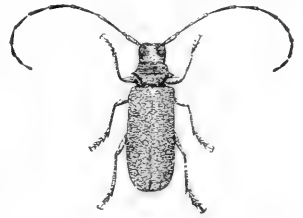


Fig. 107.—*Monohammus scutellatus*.

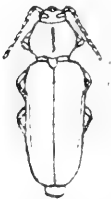


Fig. 108.
Asemum moestum.

Another group of destructive beetles is the Scolytidae. These are quite small insects; the largest scarcely over one-quarter of an inch long, and some very minute. They are, however, exceedingly destructive, as they occur in great numbers, and attack both injured and healthy trees, some species boring even into the bark of young trees. The mother beetle tunnels a groove an inch or more long under the bark, and inserts eggs at intervals. The larvæ, when hatched, eat outward in all directions, producing in some instances quite regular and effective patterns radiating from the parent burrow. Each colony loosens a portion of bark of several square inches, and when, as is often the case, the colonies are in close proximity to one another, the bark is loosened over large areas of the tree's surface and the sap layers of the wood are destroyed, thus causing the death of the tree. Among common species may be mentioned, *Pityophthorus sparsus*, Lec., *Tomicus pini*, Say, *Dendroctonus terebrans*, Lec., and *Hylurgops glabratus*, Zett.

There are also several destructive beetles belonging to the Rhyncophora (snout-beetles or weevils), which occur abundantly. The most important of these belong to the genera *Hylobius* and *Pissodes*, and are very common about millyards as well as upon the pine trees. *H. pales*,

Hbst. and *H. confusus*, Kirby, infest the trunks and limbs, boring under the bark and through the outer wood layers. *P. strobi*, Peck, infests the young shoots, in which the eggs are placed at intervals, and in the pith of which the grubs burrow, causing the shoots to die and wither. The terminal shoot is frequently affected, thus checking the upward growth of the tree, and causing it to become forked, or to have a crook in the trunk. *P. affinis*, Rand., is another common species.

Besides all the beetles that infest the trunk, branches and twigs, there are many insects preying upon the foliage. They include the caterpillars of various moths, and the young of several bugs, known as spittle-insects, also beetles, plant-lice, etc. Several sawflies belonging to *Lophyrus* and *Lyda* live upon the pine leaves, and sometimes occur in such numbers as to seriously defoliate them. A kind of gall, or swelling of the twigs is formed upon the red pine by the larva of a little snout beetle, *Podapion gallicola*, Riley, and the cones of both red and white pines are infested by the larvæ of a scolytid, *Pityophthorus coniperda*, Schwartz, which cause them to become aborted and prevent the development of the seeds.

Mention has been made of only a small number of the insects infesting our valuable pines, and in the briefest way, but even these few notes will indicate the great number of enemies they possess, and the vast amount of injury which is effected in the aggregate, by these individually insignificant little foes.

A TALK ABOUT ENTOMOLOGY.

BY J. ALSTON MOFFAT, LONDON, ONT.

It has been said by a wag, "That Entomology is the science that gives to insects long names, short lives and a pin through the middle." That bit of humour with its absence of correct information, its jocular misrepresentation, and its implied disparagement of the subject, reflects, fairly well, the condescending attitude assumed towards it, by the great majority of every community, who seem to regard it as the frivolous pastime of a few harmless lunatics, that might be better employed, but who are yet more to be pitied than blamed. Such being the common view of entomology entertained by the multitude, it is not surprising that so few should be found willing to turn their attention to it, either as a science, or for its economic bearing on the prosperity of the community, or as a recreation. Indeed, it requires a firm conviction of its value and importance in the world by those engaged in it, or the great pleasure derived from a study of it which it brings to themselves, to make them willing to endure the faintly disguised wonder and disdain they are exposed to. Many a youth with a fine appreciation of the beauty of insects has been driven from following out his inclinations by the jibes and jeers of his less favored companions.

The ever-ready excuse for avoiding entomology as a subject of earnest consideration, is the long names in a language they do not understand. That will be no obstacle in the way of anyone really desirous of understanding the subject. Names are a necessity. The design of names is to distinguish between things that differ. The value of scientific names is that they are all in unchanging language that makes them uniform the world over, regardless of what the vernacular may be. Such a condition is necessary for the systematic arrangement and classification of the objects named, without which science could not exist. The name of any object in any language must be learned before it can be known and remembered. But once the object and its name are associated together in the mind, all difficulty with the matter vanishes, and it matters comparatively little what the name may be, so long as the object is familiarly known by it. Its meaning, if it has one, will come in due time. What some seem to want to get is a name that will give them the size, form, colour and general appearance of the insect, so

that they will know it when they see it, without having learned it—an impossibility in any language, especially where there is such a multitude of slightly differing forms as there is in entomology.

Great diversity has been, and is being displayed by describers in giving names to insects. Some have had the faculty of choosing names for their species that are short, pretty and appropriate. Others have so multiplied syllables in their names, as to make it difficult even for an expert to pronounce them; yet even with these a little familiarity makes it easy. Visiting at a friend's one evening, a lady and her daughter were present. The Walking-stick insect, *Diapheromera femorata*, was brought up in conversation. For their amusement, I went over the encyclopedic description of the creature. "Filiform and linear, entirely apterous, without elytra and destitute of stridulation." "Dutch," said the daughter. "Not at all; excellent English," said I. The mother, who had been attentively listening, and who understood German, remarked: "I knew it wasn't Dutch, but I didn't think it was English." So the trouble is really in unfamiliarity with the terms used, rather than in the language in which they are given. Some of the older heads in entomology are at present suffering great inconvenience from the changing of scientific names, in obedience to the demands of the law of priority, which is causing so much confusion, as to make them think that permanence in nomenclature, which gives opportunity for becoming familiar, is of far more importance than the names themselves. In this connection I copy the following paragraph from "The Introduction to the Report on *Ophiuroidea*," by Theodore Lyman. In the voyage of H. M. S. Challenger. (Vol. V, Page 5).

"In the description of this monograph, I have tried to use simple words as often as possible, and not to add to the jargon in which zoology is now smothering. In addition to a gigantic classification, to form which the dead languages have been torn up and recomposed, there is an ever-growing crop of anatomical and embryological terms. No callow *privat doctent* but thinks he does good service in adding a score of obscure words to define his ephemeral theory. Doubtless he is not aware that his work has two faces. First, as regards himself, these new words of his have become familiar and convenient in a subject he has long studied. Secondly, as it regards his readers, not only have they never heard the new words, but have perhaps known the parts referred to by other names. They must therefore, go through three painful processes:—(a) Commit to memory, with dreary labour, like sawdust-swallowing, the novel words. (b) Learn to what parts they apply. (c) Carefully forget the old terms."

"The result of this system has been, not a language, but a jargon, such as Molière would scarcely have ventured to put in the mouths of the medical faculty in his *Malade Imaginaire*."

There are more than two hundred thousand different kinds of insects known, described and named even now, and the work is not yet nearly complete, so there are many new names yet to be got for new species. Then there are the varieties to cognominate; and in some instances these are numerous. In one case it takes sixty-two distinct names to label the species. And when we consider that duplicating of names is to be avoided, we get some insight to the difficulty of providing suitable names for such an host. The effect produced by those long and mysteriously high-sounding appellations upon people with vigorous imaginations is often quite surprising. They are inclined to picture to themselves a creature proportionately formidable to the name as it appears to them. Many amusing instances of this might be given.

On one occasion when exhibiting my collection at a fair, a young man with his female friend came along; but their tastes appeared to run in opposite directions. He called her attention to the butterflies, she said she could see butterflies any day. Then look at this grasshopper he persisted himself scrutinizing it closely. Seeing that he was an interested observer

and wishing to detain him, I said, call that a grasshopper? 'Yes. What do you call it?' *Conocephalus ensifer*. There now, said the girl, you go home and see if there is anything like that about your place. Oh no, he replied. If there was, I would sell out and leave!

Being on a visit one evening to a place where some attention had been given to collecting, a *Polyphemus* cocoon was placed on the table to interest the company. A young man eyed it suspiciously, reached out towards it timidly, and as his fingers were coming in contact with it, I called, hah! which caused him to draw back suddenly. This raised a laugh at his expense, and he then prepared for an exhibition of boldness; when I remarked, "The man does not know the risk he is running." Turning to me in all seriousness he enquired: 'What is it anyway?' Confident in the ignorance of the company in regard to names, I said, 'Why it is a *Boletotherus cornutus*.' "Oh, bejove, I won't have anything to do with it then." And he didn't.

The accusation that entomologists shorten the lives of a few insects in the pursuit of their science is quite true. But this profession of sympathy for insects is usually made on behalf of some beautiful and seemingly harmless butterfly, overlooking the fact that the handsome creature may produce an offensive looking and destructive grub. I have yet to hear the first expression of regret for the death of a potato beetle, but I have heard a lady taking credit to herself for stepping on every one she saw on the pavement. And yet the lives of each are equally valuable to the owners thereof. Upon one occasion I secured a prize in a place of public resort, and was taken severely to task by an elderly lady, for my cruelty in depriving of life such a beautiful and harmless creature. I defended myself by asking a question: Suppose you saw a caterpillar crawling on your dress, what would you do with it? "Oh, the nasty thing. I would knock it off and put my foot on it." In so doing you would be taking the life of just such a beautiful creature as I did, only in a different form. That did not change her opinion of me. Thus, feelings are allowed to control reason and judgment. A poet has asked: What's a butterfly? And answered: "At its best, 'tis but a caterpillar drest."

It is no unusual thing to hear individuals when looking at a case of butterflies, go into raptures over their beauty, and extol the marvellous works of the Creator; but when confronted by one of beetles, they will express their horror and disgust at what they regard as most objectionable creatures; and yet they were originated by the same inventor, and are products of the same workshop, and the one exhibits as much wisdom and beneficence in their construction, and as perfect an adaptation to their requirements in nature as the other. And our duty is to endeavour to discover and disclose wherein that lies, so that we may be able in some measure to give an answer to that oft repeated question: "What were insects made for anyway?"

When Topsy was asked "Who made her," she said she wasn't made, she grew; and in any correct use of language Topsy was right. Its a long while since any living thing was made in this world, and yet there was a time when no living creatures existed on this globe. Therefore, they must have been originated at some time, and in some way. And the accumulated evidence strongly vindicates the belief that they were originated by design, for a purpose. And ever since, those who have survived the fluctuations of time, have kept on propagating their kind in accordance with the laws of their being with which they were originally endowed. Moulded and modified in many ways by external conditions and altered circumstances, the better to fit them for performing their part in assisting to maintain the balance of nature. Man being, preëminently the disturber of harmony in this world.

As to the "Pins" which are so much in evidence in a collection of insects, they are a necessity for the handling of specimens without injury when under examination, as well as to carry labels and fix them firmly in place for future observation and study. Many observant persons when looking at a collection of insects, will express great surprise at the number of kinds therein displayed that they have never seen before, and wonder that it should be so. But it is just what might be expected, as a great many insects cannot be distinguished from

one another when flying about. It is not until they are captured, killed, pinned and spread, that the difference between them can be discovered. Yet many people see nothing in the pins but an evidence of cruelty on the part of collectors. No intelligent collector of the present day would think of pinning an insect before killing it, when there are so many approved methods of giving them pleasantly and instantly everlasting sleep ; and thereby secure his specimens in perfect condition by preventing fluttering. Much misinformation prevails even amongst educated persons about the suffering of insects, which is not quite creditable to them. Suffering is the result of being possessed of a nervous organization. The more highly this organization is developed, the more sensitive to suffering is the creature possessing it. All creatures are not thus equally endowed, therefore all creatures are not equally liable to suffering. The human race is supposed to stand highest in this respect, and yet there are wide differences between individuals of it. A highly cultivated and refined woman is far more liable to suffering, mental and physical, than one who has been exposed to rough conditions all her life. Insects have a very low organized nervous system, and therefore are not, and cannot be, liable to acute suffering. Apart from the science of life in that respect, it has been abundantly demonstrated. As an illustration : A moth asleep in day time on the side of a tree, has had a pin passed through its body, and firmly fixed to the tree without disturbing its repose. It remained in that condition without showing signs of its discomfort until evening came, when it wanted to fly about, then it fluttered vigorously ; which might have been mistaken by an observer as an evidence of suffering, when it was only the result of its eager desire to indulge its nocturnal habit. I have cut half the abdomen off a mosquito that was feeding, and it did not injure its appetite in the slightest. But it is our nature to associate suffering with injury, therefore it should not be wantonly indulged in. Children especially should be taught to deal mercifully with every living creature, even a mosquito, and dispatch it as expeditiously as possible, to save others from suffering. But I have heard boys condemned as wicked and cruel when chasing and capturing butterflies, and peremptorily ordered to stop it, which was intended as a fine exhibition of tender consideration for the feelings of the insects, whilst it showed none whatever for those of the boys. Surely a boy is of more value than many insects. Sentimentalism, however lofty, is not edifying.

Man's prerogative in this world is to dominate nature, and make the powers of nature subservient to his advancement, and all modern progress and improvement in horticulture, agriculture and stock raising, is founded on the principles of man's ability to improve upon nature for his own benefit. But to accomplish that, man's work must be in harmony with the laws of nature, else disaster may follow. Nature when left to the operation of its own beneficent laws, succeeds in establishing and maintaining an exquisitely adjusted balance between the numerous conflicting elements in its own vast domain. But man in his eager desire for large profits and quick returns, thinks he can accomplish his ends by more direct methods ; ignorant of those finely adapted harmonies, he goes to work in his own way to bring them about, but often discovers to his sorrow, that he has started some of nature's machinery in motion that is working in an opposite direction to his intentions, and is threatening his ruin rather than his advancement ; so he has to call a halt, to reconsider his methods, and with patient labor, observation and research try to discover where he has gone wrong, what he has overlooked and how to do better. When Henry Ward Beecher undertook to be a farmer, he met with so many unforeseen and unexpected hinderances to success, that it seemed to him as if all nature had joined in a league against him, and he was ready under the influence of such feelings to give that reply which raised such a storm against him at the time. When asked how to get rid of Canada-thistles, he said, " Cultivate them for the market. Then the bugs will attack them and the mildew will blast them. Then the grubs will eat their roots, and the caterpillars will devour their leaves. Their stocks will rot, and their blossoms fail to

produce seed. The frost will cut them by night, and the sun will scorch them by day, and you will soon have no thistles." And this conflict between man and nature, is from his violation of the laws of nature, always going on; and will, until he more thoroughly understands nature's laws and how to obey them. And the more artificial man's methods become, the higher is the intelligence required to make them successful.

The community may be divided into the rural and the urban, or such as live and work in the country, and those that make their living in towns and cities. It is the products of the rural workers' labour that are most exposed to insect depredations; and, as a rule, it is they who give the least attention to such matters. The cause for this condition of things is not far to seek. The rural workers' labour and leisure are very unequally divided. Summer is short, and the work is pressing. The crops must be got in; and the crops must be got off. And during the process there is little time and less inclination to give attention to the operations of their insidious insect foes, that may be robbing them of half the profit of their labours. In the winter time they have the leisure to gain information, but it is not the season to put it in practice to any extent; so with the next summer's advent the usual rush begins, and their time as well as their inclination for that kind of work disappears, and their attention to the depredations of insects is put off to the future.

An idle man out for a stroll, and a delightful health-refreshing converse with nature, reached a projecting point of the Niagara escarpment, situated about four miles east of Hamilton, from which, on a clear day, Toronto can be seen. The landscape below, once lake bottom, but now dotted with human habitations that are surrounded by regularly laid out and well cultivated fields, orchards and vineyards, their dimensions reduced by distance, until they look like flower-beds in a well kept garden, with Lake Ontario shining bright and calm beyond. A prospect of charming loveliness. A woman came out of a harvest field near by, dressed-suited to her work, but quite different from what she wore when he had met her in the city. She thought it necessary to apologize for her appearance, and kept it up to his discomfort. So to change the subject he remarked, "What a magnificent view you have from your place." The reply was, "Troth then and its much we care about the view, working like the slaves we are all the day." He could but bow to the justness of her rebuff, and ponder on its widespread and far-reaching applicability. No time—no inclination for such indulgence. Severe and continuous toil is not conducive to mental cultivation.

Amongst those that live and work in urban locations, where labour and leisure are more equally divided, there always have been some who were fascinated by the beauty of insects and their intensely interesting habits of life. Many of these in the pursuit of their favourite study have seen, realized and become impressed with the thought of what tremendous loss the rural workers are sustaining from the depredations of insects, and have persisted in calling attention to it, and urging that measures should be taken to prevent it. Their thoughtful consideration has not been without result. Governments, which have the interest of their country at heart, having had their attention called to the matter, and seeing that those most directly interested were, from want of time, knowledge or inclination, doing nothing, and that the whole community was suffering loss thereby, have taken hold of the matter, and are looking out for persons qualified in some measure by previous observation on the subject, and are appointing them to give their whole time and attention to that work. Such action is in perfect accord with the established principle of the division of labour for the attainment of the highest results with the least expenditure of time, money and labour. And the rural workers realizing the advantage of such an arrangement, will be willing to sustain the procedure, when they find it is profitable to have that done for them, which they may not have time or capacity to do for themselves; and the whole community will be benefited thereby. So now the time has come when attention to the work and ways of insects is getting acknowledged to be of real

importance in the management of rural affairs, which cannot well be done without, and work in that line will become an established profession. Men being educated for it, and their services having been found to be profitable will soon become necessary, when they will be called for as regularly and paid for as willingly as those of any other profession. Thus entomology has vindicated its claim to recognition as a science useful and important to the community.

The educational authorities are now alive to the great advantage that would result to the whole community if it were in some measure informed upon natural history subjects, and to that end have placed them in the lesson course of schools. But it is doubtful if a more effectual method could be taken of turning children against natural history than by making it one of the tasks they have to learn, and which the most of them will look back upon with dislike, and be glad to have done with. Whereas, if they were encouraged to make natural history collections, themselves choosing the department, it would be in harmony with their natural inclination to collect something, and would at the same time form a safe outlet for their surplus energy, which would produce such an agreeable impression on their minds as to go with them in after-life and induce them to take it up again whenever opportunity presented itself. A consummation much to be desired and which may be realized when parents and teachers themselves have acquired a real love of the subjects.

Mankind is instinctively utilitarian, and this is reputed to be the most utilitarian age that has been. The disposition of the race is being intensified in the individual, by the tendency of the times in which he lives. So everything is tested by the standard of: How is he, or they, to be benefited thereby? and to what extent? But the great majority of mankind have no choice in life, they are controlled by necessity, the necessity of making a living. And this so occupies their attention that they have little time for anything else. But constant application of mind or body to one particular vocation becomes monotonous and depressing. So for the health of body and mind, relaxation is necessary. Many suppose that such is only to be obtained by an entire absence of occupation; this is a mistake, the most refreshing relaxation is often found in a mere change of occupation. The most tiresome day of many a man's life is a holiday; simply because he has nothing to do. Activity is conducive to happiness. Many who have been successful in business, and have got over the necessity of working for a living, yet remain in business, because they have no other way of pleasantly and profitably occupying their time. Now here comes in the immense advantage which those possessed of some knowledge of natural history subjects have over those with none. A means of healthful recreation is always within their reach. All they have to do is to open their eyes and they find objects of interest liberally strewn around them. So that, whether it be the weary toiler with only his tiresome holiday to spend, or the successful man who has got beyond the necessity for labour, and has much time to spare, they will find in it a never-failing means of profitably occupying whatever time they wish to give to it. When the eyes are opened to the beauties of nature, the pleasure of a walk or a drive is immeasurably enhanced by the ability to intelligently recognize the diverse objects that are constantly presenting themselves to view. The enjoyment of rest and repose in the shade on a hot summer's day, is quadrupled by observing the different forms of the trees, with their characteristic manner of growth; and the kind of birds and insects that frequent them. And to be able to distinguish them by name as recognized acquaintances, is a yet greater addition to the pleasures of life. One great advantage of taking recreation in the observation and consideration of natural history subjects is, that it requires no elaborate preparation to begin with. Every one is able to appreciate in some measure the beauties of nature and the faculty will increase and strengthen with exercise, so that all that is required of anyone is to begin to observe. Observation excites curiosity, curiosity leads to enquiry, enquiry tends to increase knowledge, and the more one knows, the more one desires to know. And natural history subjects are so diverse in their manifestations, as to provide something suited to

every taste. Then they are not the monopoly of the rich or the learned, but are open to all who have an eye to see, and a mind to perceive. They are educational in their influences, leading to habits of thought, observation and self-control. They are elevating in their tendency, leading away from that which is base and ignoble, to that which is pure, beautiful and refining. Physically they are healthful; most departments requiring those out-of-door activities that brace and strengthen. And they are perfectly inexhaustible, and such a source of enjoyment, as only those engaged in them have the slightest conception of. Thus satisfying man's utilitarian disposition to the utmost.

In nothing of all that, does entomology fall short in interest and importance to any other department of natural history. There are four times as many different kinds of insects in the world as of all other kinds of animal life put together, and their powers of increase may be reckoned at fifty times as great. Then insects have four separate stages of existence to investigate before you can be certain that you have an exact knowledge of their life history. Whilst the simple question, "What constitutes a species," amongst them, remains as yet wholly unsettled. If it is the beauty of nature that attracts your attention, you will find in insects the equal of flowers, with the added charm of animation; combining in colour and form the highest art with the poetry of motion. It is the strange and wonderful that excites your interest; no where in nature can be seen such marvels as in the transformations of insects—such departures from the ordinary course of life in other creatures; such contrasts in conditions; from the lowly and grovelling, nourished on garbage; to the elegant and refined, revelling in the sunbeam and sustained by nectar. In their individual instincts along the lines of natural capacity, excelling in correctness the most cultivated reason of man. In the perfect adaptation of parts to their uses, they are far in advance of the inventive powers of a human genius, and in many instances they exceed in grotesqueness, the imaginative creatures of the wildest romancer. And whilst they are considered to be the ephemeral things of a day, their pedigree can be traced to the remotest antiquity: and no where else can be found such beautiful illustrations of natural theology. Thus providing abundant scope for the exercise of every faculty of the human mind.

THE NORTH-WEST (CANADA) ENTOMOLOGICAL SOCIETY.

ANNUAL MEETING.

On Wednesday afternoon, Nov. 5, 1902, at the High school, Calgary, was held the fourth and last annual meeting of the North West Entomological Society. The meeting was one of very great interest, for it involved the extinction of the Entomological Society and the founding in its stead of the Territorial Natural History Society.

ENTOMOLOGICAL SOCIETY.

The chair was occupied, until the burial of the Entomological society, by the Right Revd., the Bishop of Saskatchewan and Calgary. The large room was crowded and among those present were Chas. W. Peterson, deputy commissioner of Agriculture, Regina; T. N. Willing, Regina; Dean Paget; Percy B. Gregson; N. D. Sanson, curator of Banff museum; F. H. Wolley-Dod; A. G. Wolley-Dod; C. Marker; Principal J. B. Boyce; Messrs. King, Tomlinson and about forty other residents of Calgary and district.

Letters in support of the meeting were received from the Mayor of Calgary and other gentlemen.

After an interesting opening speech by the chairman, Mr. Percy B. Gregson, as president of the Entomological Society, was called upon to address the meeting.

PRESIDENT'S ADDRESS.

Mr. Gregson said that the Society was now in its fifth year of existence and explained some of the difficulties that had to be overcome in the course of its establishment. Very early in the society's existence, botany was made a complementary subject with entomology, and by constantly hammering away, holding meetings and by pointing out on every possible occasion the manner in which agriculture was affected by insects and plants, farmers were interested in the welfare of the society.

One difficulty to contend with has been, not so much the prejudice of the young people against insects, but the prejudice of the parents, which however was passing away. The president then proceeded to describe the formation and operation of one of his field clubs. At first two or three boys would join for the fun of the thing—perhaps one of them might be in earnest—and a girl or two. In the afternoon they would go out, and from the varied assortment of things taken (bags, beetles, spiders, caterpillars, butterflies, etc.) a caterpillar obviously parasitised would be selected, and the circumstance and importance of it explained. Then perhaps on another occasion the attacks of a small fly on the common prairie aster would be noted, and the young people asked to find one free of attack. They would by that process learn how very few plants there were which had no insects of any kind attacking them. The membership of the Lacombe Field Club now numbers 22, all filled with a sense of responsibility as naturalists. Three out of four who have gained prizes this year are members of this field club, and these prizes were gained against a competition open to all the Territories.

There is now also being organized at the Red Deer school a field club for that district on the lines of the Lacombe Club, so that next year (if all is well) there will be two such clubs in full operation.

Speaking as to the use of the study of entomology, or botany, or any other subject of natural history, Mr. Gregson said that even looking at it as a hobby there is this value in a hobby, that of a definite purpose in view. But there are other uses. Botany is the study of the life history of all plants. It teaches us their modes of growth, habits, natures, localities, etc., so that we learn just how they affect the farmer for good or bad, and in the prize competitions for this year it was made a special condition that the collections should specify these particular features. Then take entomology. This means the study of the life history of all insects. It is not enough to simply know the names of the insects, though that is a good step forward, but their habits and life history from the time they hatch from the egg until they undergo their final change must be learnt as far as possible, and as we learn so our interest grows and our collections should show this life-history.

Another use of the study of natural history is the remarkable development it induces of the faculty of observation—in the young especially. It is extremely interesting to watch this development. About two years ago one of the young folk to whom Mr. Gregson is teaching entomology came to him and said: "Mr. Gregson, I shall never get a collection, there are so few insects." He was told to persevere, and this summer he said: "Mr. Gregson, there seem to be insects everywhere."

This is a young boy—a boy 12 years old—who has gained the first prize in entomology this year. His collection was handed around the room and excited much interest. Another is the love of nature which these studies cultivate—one of the most valuable possessions one can have, and it is well that this should be cultivated while we are young.

As an almost natural corollary with the work of the entomological society, plans have been formulated for the establishment of natural history museums at the schools of Red Deer and Lacombe, which the pupils are intended to collect for and augment every year. These museums

are designed to include every subject of natural history (plants, insects, fossils, minerals and other geological specimens, birds, shells, etc.) a few cases for each school have already been ordered to be constructed as a start.

Such, then, is the history of the North West Entomological Society up to the present day.

Letters were then read from J. A. Calder, deputy commissioner of education, Regina ; Professor C. C. James, deputy minister of agriculture, Ontario ; H. H. Lyman, late president of the Ontario Entomological Society, etc., expressing the most favorable opinions with regard to the course adopted.

PRIZE WINNERS.

Mr. Gregson then announced the names of the winners of the prizes in Territorial competition for insects and plants. The winner of the prize of \$2.50 (given by Dr. James Fletcher, Ottawa), for best collection of injurious and beneficial insects is Master D. Tipping, Blackfalds. The prize given by the society for best numerical collection of insects was won by Master Benjamin Howell, Lacombe. For best collection of plants, the prize of \$2.50 (given by Dr. Fletcher) was won by Miss Lucy Howell, Lacombe : and second prize (given by the Society) was won by Miss Mary McDonald, of Urquhart.

The balance sheet was then read, showing a deficit of \$40. (A special donation of five dollars has since been received from Mr. H. H. Lyman of Montreal).

DISSOLUTION OF THE SOCIETY.

Mr. Gregson then stated that he had now arrived at one of the saddest episodes in the history of the Entomological Society, namely, its suicide. He proposed that the Entomological Society should be discontinued, and explained that this did not mean oblivion, for that from its ashes would arise, he trusted, a society with greater scope for work, on the lines of a natural history society for the Territories and on this basis he understood that the existing members would transfer their allegiance to the proposed new society.

Before proceeding with the new business, Principal Boyce expressed his desire to assist in the formation of a museum at Calgary and Mr. Tomlinson offered to help the young collectors and others in every way he was able towards that end, and Mr. Gregson promised his advice and cooperation.

Moved by T. N. Willing and seconded by C. W. Peterson, that a vote of thanks be extended to the officers of the Entomological Society for the energetic and untiring way in which the affairs of the Society have been conducted. This was carried.

Moved by Mr. Gregson, and seconded by Mr. A. G. Wolley-Dod that a vote of thanks be extended to the chairman, His Lordship the Bishop of Saskatchewan and Calgary.—Carried.

TERRITORIAL NATURAL HISTORY SOCIETY FORMED.

Moved by Mr. Gregson and seconded by Mr. A. G. Wolley-Dod that a new society be formed under the title "The Territorial Natural History Society" with fee of one dollar for Membership.—Carried.

The following are the objects which this society has been organized to carry out, viz :—

(a) To instruct farmers how to recognise beneficial and injurious insects, weeds and birds, and how to combat those that are injurious.

(b) To promote an interest in and the study of the economic and scientific phases of the various branches of Natural History.

(c) To establish one or more Natural History Museums at central points, and Collections in connection with Schools throughout the Territories.

Mr. Chas. W. Peterson was then elected to take the chair, with Mr. T. N. Willing as secretary pro tem. for the proceedings.

Moved by Mr. N. B. Sanson, and seconded by Mr. F. H. Wolley-Dod that the Divisions of Entomology, Botany and Ornithology be at once established.—Carried.

A draft of the constitution of the Territorial Natural History Society was then considered section by section and finally the same was adopted.

The following officers were then elected :

President	Percy B. Gregson.
First Vice-Pres.	C. W. Peterson.
Second Vice-Pres	G. Wolley-Dod.

Directors, Entomology, F. H. Wolley-Dod, Calgary, and Rev. J. Hinchcliffe, Red Deer ; Botany, Mr. Nivens, Prince Albert, and Mr. Hutchinson, Regina ; Ornithology, Dr. Henry George, Innisfail, and F. Dipple, Calgary, and T. N. Willing, Regina, Secretary-Treasurer.

It was decided that the report of the president of the late North West Entomological Society should be included in the first annual report of the Territorial Natural History Society, and also inasmuch as the excellent work done by the Entomological Society led to the formation of the Natural History Society, that the liabilities of the former be assumed by the latter.

It was resolved that three official Museums should be established, one at Blackfalds for the district north of Calgary, with Mr. Percy B. Gregson as Curator ; one at the Territorial capital (Regina), with Mr. T. N. Willing as Curator ; and the third at Calgary, with Principal J. B. Boyce as Curator.

A resolution was adopted unanimously urging the Territorial government to provide at the earliest possible moment the necessary accommodation for a public natural history museum, such as is maintained in all the provinces.

After a vote of thanks to the Chairman, a motion to adjourn was adopted. It was decided to hold the next annual meeting at Calgary, during the Convention week of the Agricultural Societies in May.

WILLIAM E. SAUNDERS.

In this issue of our Report, we have pleasure in presenting to our readers a portrait of the Secretary of the Entomological Society of Ontario for the last fifteen years, MR. WM. E. SAUNDERS, who is well known as a prominent member of the fraternity of Canadian Naturalists. Mr. Saunders's home is in London, where he was born and where most of his life has been spent. His father, Dr. Wm. Saunders, Director of the Experimental Farms of the Dominion, has always been devoted to the study of the natural sciences, and hence the son's attention was in early years directed to similar pursuits, interest in them being maintained by the making of collections in the different departments. Geology, Botany, Entomology and Ornithology all in turn provided object lessons for study, training the mind to habits of close observation, and filling the leisure of later years with delightful employment.

After a few years of miscellaneous collecting, Mr. Saunders turned his attention more exclusively to Ornithology, and as soon as the use of a gun was permitted, he commenced a scientifically arranged collection of our native birds, showing male and female in summer and winter plumage, with any variations from the type, also the nest and eggs of each species. Year by year the collection is added to, until now it numbers over one thousand specimens. Mr. Saunders's birds are his intimate friends, and whether in his own house or on the public platform, his "Bird Talks," illustrated with specimens, show to his audience that he speaks of what he has learned by personal experience in the fields and woods. His enthusiasm for this study is such that he counts it no hardship to walk miles into the country in time to hear some favorite songster greet the dawn. He has also been known to spend a night in the woods in the depths of winter, just to see what he missed by spending his nights in bed !

About two years ago, Mr. Saunders accompanied his father on an official visit to Sable Island, a place he had long wished to go to in order to see the only known breeding place of the "Ipswich" sparrow. The impressions of this trip were given to the public in an article in one of our local papers, which has since been adapted for some of our scientific magazines. Mr. Saunders was able also to enrich his collection by several specimens of the rare sparrow, as well as some other beautiful birds, which have their habitat on that interesting island.

Although Mr. Saunders is kept fully employed in looking after his business interests, he finds a change of work sufficient to afford him the rest he needs, hence he has employed his leisure time in many pursuits, and while Ornithology may be called his principal "hobby," he has gone rather extensively into gardening and horticulture generally; extensively, considering the size of his lot on Central Ave., but the amount of fruit and flowers there produced is a surprise and a pleasure to all his summer visitors. His well known love for these pursuits, and his knowledge of horticulture generally has occasioned his recent election to the chairmanship of the committee who have in charge the care of the street trees in London.

Mr. Saunders received his education principally in London, though two or three years were spent in boy's colleges elsewhere. As it was considered best for him to enter the drug business so long conducted by his father, he was sent for two years to the Philadelphia College of Pharmacy, where he graduated with the highest honours. Soon after his return to London, he was taken into partnership with his father, but on the latter being appointed Director of the Experimental Farms of the Dominion, Mr. Saunders retired from the retail business, and entered the wholesale exclusively.

On the establishment of the Western University he was appointed to the chair of Chemistry, which he held until the claims of his own business forced him to relinquish the position.

EDMUND BAYNES REED.

The older members of the Entomological Society of Ontario will, no doubt, welcome with much pleasure the portrait of Mr. EDMUND BAYNES REED, which is prefixed to this volume. He was one of the small band who originated the Society on the 16th of April, 1863, and is one of the few survivors who may expect to commemorate its fortieth anniversary a few months hence.

Mr. Reed came to Canada from England when a young man and took up his abode in London, where he for some time practised his profession as a lawyer. Later on he became Secretary-Treasurer of the Synod of the Diocese of Huron and continued to occupy this position till he left London for British Columbia in 1890. He was always devoted to Natural History and especially to the collection and study of insects. His leisure time was largely given up to these pursuits and to the work of the Entomological Society, in which he took the warmest interest. He and Dr. Saunders were instrumental in forming the London Branch of the Society and keeping up the enthusiasm of its members. When the head-quarters of the Society were removed to London and there was in consequence no further need of a Branch, Mr. Reed took an active part in everything that was done and gave most material help in the formation and increase of the library and collections. He was Secretary-Treasurer of the Society in 1871-2-3 and from 1880 to 1886; Vice-President in 1874, 1877 and from 1887 to 1889; member of the Council from 1874 to 1876 and in 1878 and '79; and during many of these years Librarian and Curator in addition. The following extract from the report of the Council for the year ending August 31st, 1890, bears testimony to his usefulness and services:

"In consequence of the removal of Mr. E. Baynes Reed from London to British Columbia, to take charge of the Dominion Meteorological Station at Victoria, it will be necessary to make

some new arrangements for the care of the library and collections, and the performance of the official work of the Society. . . . The Council desire to place on record their feelings of deep regret at the removal of Mr. Reed from this Province and the loss which the Society thereby sustains. Mr. Reed is one of the original members of the Society and for more than a quarter of a century has been one of the most active and zealous of its officials, filling at different times the positions of Vice-President, Secretary-Treasurer, Librarian, Curator and Auditor. To him it is especially due that the library has grown to its present dimensions and value, and that so much progress has been made by the Society in many directions. The Council beg to thank Mr. Reed for his services in the past and wish him all possible success and prosperity in his new and important sphere of labour."

Mr. Reed was a constant contributor to the pages of the *Canadian Entomologist* from the very first volume, in which appeared five articles from his pen. His papers, largely collecting notes, records of rare captures, etc., were always interesting and valuable; he also furnished descriptive articles on larvæ, an accentuated list of Canadian Lepidoptera, a report to the Department of Agriculture (jointly with Dr. Saunders) on the Colorado Potato-beetle which had then invaded Western Ontario from the neighbouring State of Michigan, and popular papers on common insects.

In the preparation of the early annual reports of the Society he took a large share and contributed elaborate and valuable papers, as follows: Insects affecting the plum, Report I. (1870), pages 53-63, and Report II. (1871) pp. 22-26; Insects injurious to the potato, *ibid*, pp. 65-81; Insects attacking the cucumber, melon, pumpkin and squash, *ibid*, pp. 89-92; Insects affecting maple-trees, Report III. (1872) pp. 35-43; Insects affecting the peach, *ibid*, pp. 44-47; Insects affecting the potato, *ibid*, 48-50; Some common insects which affect the horse, ox and sheep, Report IV. (1873) pp. 34-41; Entomological contributions, Report V. (1874), pp. 11-16; Sphingidæ—Hawk-moths, Report XII. (1881), pp. 48-70; Diptera—Two-winged flies, Report XIII. (1882), pp. 45-53; and short articles in several issues. From the above list it will be seen that Mr. Reed gave much attention to economic Entomology and did some very excellent work in that department. It was quite fitting, therefore, that he should have been one of the company who, in August 1889, formed the Association of Economic Entomologists and signed its original Constitution.

Another valuable and important work that Mr. Reed performed for the Society was the compilation of a General Index to the first thirteen Annual Reports, 1870-1882, which proved of the greatest use for many years to the members of the Society and others who had occasion to refer to these publications.

For some time before he left London, Mr. Reed took a great interest in Meteorological Observations and in connections with the Observatory at Toronto established a local station and installed the necessary instruments. His anemometer and vanes were placed on the top of the Cathedral tower and connected by wires with his residence on the corner of Park and Queen's Avenues. The work that he thus performed was so accurate and satisfactory that he was selected to take charge of the Pacific Coast Division of the Dominion Meteorological Service, and since 1890 he has continued to fill the office of Superintendent of the Observatory at Victoria, B.C. Though his time is fully taken up with his official duties, he continues to be interested in Entomology and is a member of the British Columbia Natural History Society. His many friends will, no doubt, heartily join with us in the wish that he may enjoy the blessings of health and well-being for many a year to come and retain the vigour and vivacity which have always been his characteristics.

C. J. S. B.

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THIRTY-FOURTH ANNUAL REPORT
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1903.

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO).

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TORONTO.



REV. GEORGE WILLIAM TAYLOR, F.R.S.C., F.E.S., F.Z.S.





PLATE 1. The Kottmeier orchard of about 400 plum-trees at St. Catharines treated with the McEam Carbohe Wash. (Pho. Aug. 14, 1903). (See pages 42 to 45.)



PLATE 2. A peach orchard near St. Catharines practically destroyed by the San José Scale, containing 10,000 trees, now neglected and left untreated. (Photo. Aug. 14, 1903.)

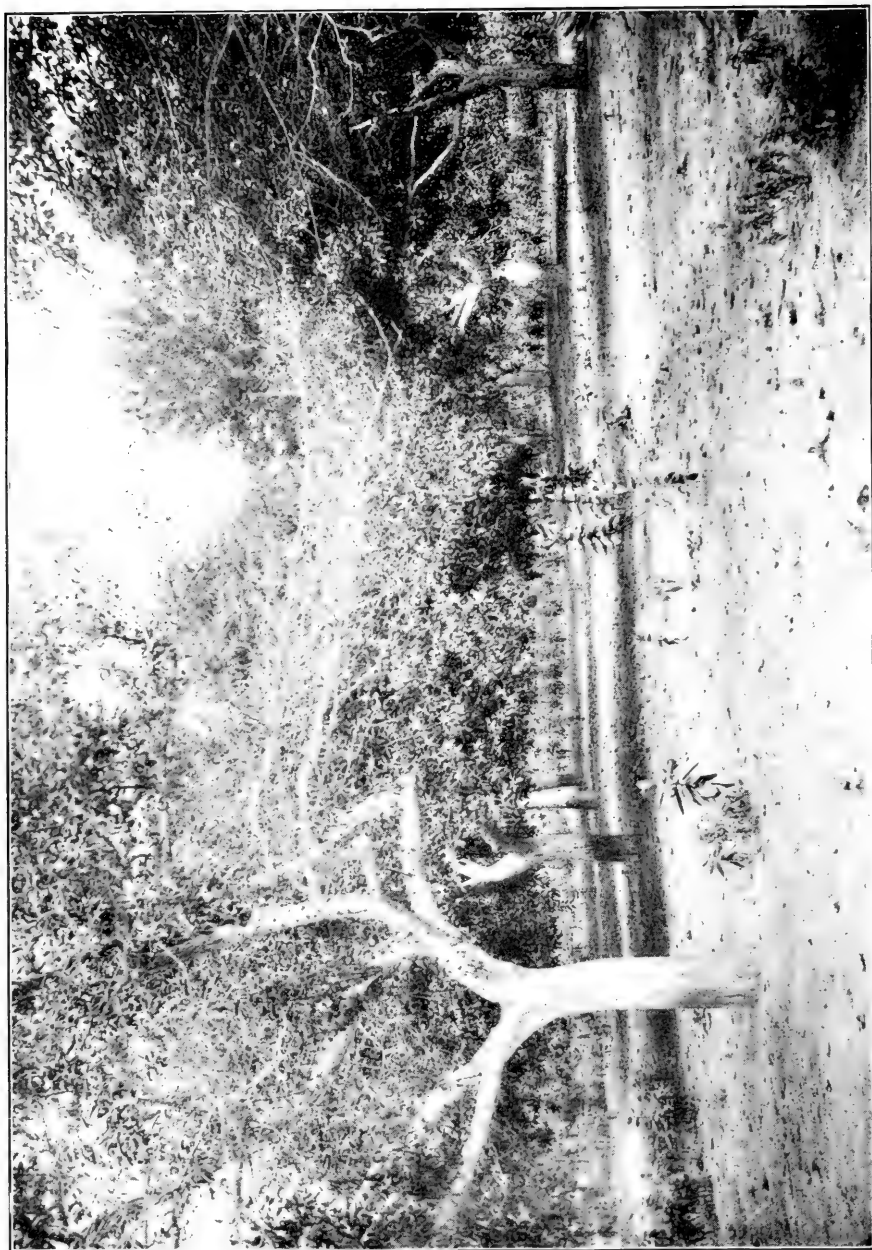


PLATE 4. An apple orchard belonging to John D. Wigle, Kingsville, sprayed with lime, sulphur and salt in early spring. Very few scales could be found at time of visit. (Aug. 27, 1903.)

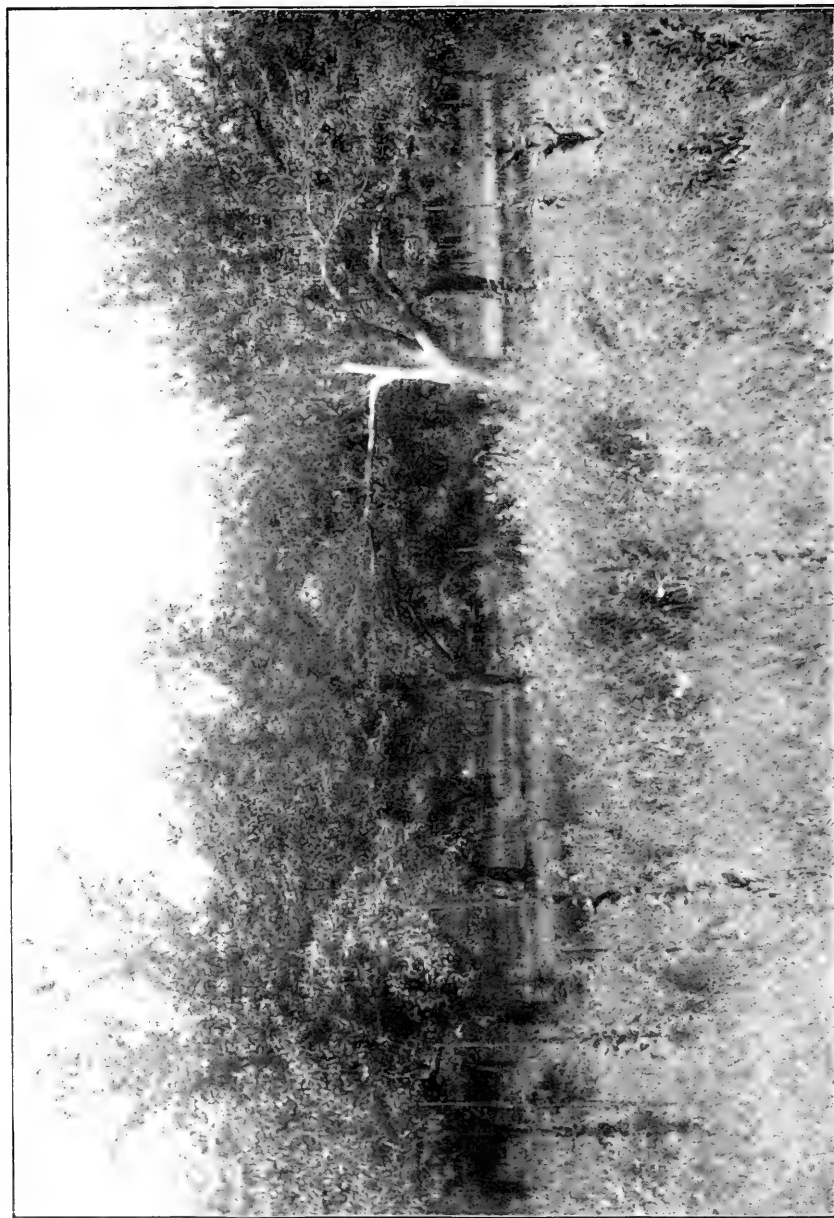


PLATE 3. A large apple orchard near Kingsville very badly encrusted with San José Scale. The owner refused to treat the orchard himself, or to allow the township sprayer to do it for him. This orchard is now a menace to the neighboring ones. (Photo, Aug. 27, 1903.)

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THIRTY-FOURTH ANNUAL REPORT
OF THE
ENTOMOLOGICAL SOCIETY OF ONTARIO

1903.

To the Honorable John Dryden, Minister of Agriculture :

SIR,—I have the honor to pre-ent herewith the Thirty-Fourth Annual Report of the Entomological Society of Ontario.

The Fortieth Annual Meeting was held in Ottawa, on Thursday and Friday, September 3rd and 4th, 1903. A full account of the proceedings, with the papers read and reports submitted from the various Officers, Sections and Branches of the Society, will be found in the following pages.

The *Canadian Entomologist*, the monthly organ of the Society has been regularly issued during the year, and has now completed its thirty-fifth volume, which in scientific value and interest fully maintains the high reputation which it has so long held.

I have the honor to be, Sir,

Your obedient servant,

CHARLES J. S. BETHUNE.

LONDON, ONTARIO.

Editor.

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Division No. 4—G. E. Fisher, Freeman.
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Auditors—W. H. Hamilton and S. B. McCready, London.

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Delegates to the Western Fair—J. A. Balkwill and W. E. Saunders, London.

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Committee on Field Days—The Chairmen of the Sections and Dr. Woolverton, Messrs. Balkwill, Bowman, Law, Moffat, Rennie and Saunders, London.

Library and Rooms Committee—Messrs. Balkwill, Bethune, Bowman, Dearnness, Moffat, and Saunders, London.

THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

ANNUAL MEETING.

The fortieth annual meeting of the Entomological Society of Ontario, was held at Ottawa on Thursday and Friday, September 3 and 4, 1903. The chair was taken by Professor Wm. Lochhead of the Ontario Agricultural College, Guelph, President. Among the members present were Messrs. H. H. Lyman, A. F. Winn, Charles Stevenson, G. A. Moore and A. E. Norris, Montreal; Mr. John D. Evans, Trenton; Messrs. J. B. Williams and C. H. Myers, Toronto; Rev. Dr. Bethune and Mr. W. E. Saunders, London; Dr. James Fletcher, Messrs. Arthur Gibson, W. H. Harrington, Baldwin and others, Ottawa; Mr. C. H. Young, Hurdman's Bridge. The Society was also favoured with the presence of Dr. L. O. Howard, United States Entomologist, of Washington, D. C., who took part in the discussions.

Letters expressing regret at their inability to attend were received from the Rev. Dr. Fyles, South Quebec; Mr. C. E. Grant, Orillia; Mr. E. M. Walker, Toronto; Mr. G. E. Fisher, Freeman; Mr. Dwight Brainerd and Mr. G. Chagnon, Montreal; Mr. J. A. Bulkwill and other members residing in London; and from Prof. C. C. James, Deputy Minister of Agriculture for Ontario, explaining the absence of the Hon. J. Dryden and himself owing to engagements in connection with the Dominion Exhibition at Toronto.

During the morning of Thursday, September 3, a meeting of the Council was held in the Board of Trade Room, Elgin Street, Ottawa, which was kindly placed at the disposal of the Society during both days' sessions. It was decided that sheet cork and Entomological pins should be sold to ordinary members (that is those residing in Canada) at cost price; to dealers in Canada from whom students procure supplies at 5 per cent. and to others at twenty per cent. advance on cost. The Treasurer's report was discussed and in consideration of his statement shewing that the balance at the close of each financial year had been steadily declining during the last six years and that therefore the Society was evidently spending more than its income, certain economies were resolved upon which, it is expected, will place the funds in a more satisfactory condition. After the preparation of the annual report the Council adjourned.

In the afternoon the Society met at 2.30 o'clock, the President, Prof. Lochhead, in the chair. The Reports of the Council, the Treasurer, and the Librarian and Curator were read and adopted; also the reports from the Branches and Sections of the Society and those of the Directors on the insects of the year. At the close of the reading of the last mentioned there followed a general discussion on the insects referred to and much useful and interesting information was given. A number of papers were also read and specimens exhibited in illustration.

THE REPORT OF THE COUNCIL.

The Council of the Entomological Society of Ontario begs to present its report for the year 1902-3.

It has much pleasure in drawing attention to the fact that it is now forty years since the Society was organized, the first meeting having been held in April, 1863. Three of the original members, Dr. William Saunders, Rev. Dr. Bethune and Mr. E. Baynes Reed have continued to take an active interest in the welfare of the Society from that time to the present, Dr. J. H. Sangster of Port Perry, is another surviving member of the original small band of Entomologists who met in Toronto two score years ago.

The thirty-ninth annual meeting of the Society was held in London in October, 1902, and was well attended by members from a distance as well as by those resident in the neighborhood. It was also favoured with the presence of Prof. C. C. James, Deputy Minister of Agriculture for Ontario. During the first afternoon a conference was held to discuss the prevalence of the Pea Weevil in Ontario and to consider the best means of controlling its ravages, which have of late years become very serious. Valuable information was given on the various aspects of the subject by Dr. Fletcher, Prof. Lochhead and others, and a resolution was adopted calling the attention of the Superintendent of Farmer's Institutes to the matter and suggesting that it should be brought prominently before all their meetings, and that object lessons in fumigating peas should be given throughout the country. A public meeting was held in the evening at the Normal School when the presidential address was read by the President, Rev. Dr. Fyles, and Prof. Lochhead gave a lantern lecture on some common Butterflies and Butterfly Hunters. The remaining sessions were occupied with a series of valuable papers, reports of officers, etc., and the examination of interesting specimens.

The thirty third Annual Report on economic and general Entomology was presented to the Minister of Agriculture for Ontario in January last and was printed and distributed in March. It contained 132 pages illustrated with 108 engravings in the text and photogravure portraits of Messrs. E. Baynes Reed for many years an efficient officer of the Society and W. E. Saunders the present energetic Secretary. Besides the account of the conference on the Pea Weevil and the proceedings at the annual meeting the Report contained papers on the injurious insects of the year by Messrs. Fisher, Young, Evans, Walker, Balkwill, Stevenson, Moffat, Prof. Lochhead and Dr. Fletcher; "Notes on *Danaus archippus*" by Mr. Lyman; "The Paper-making Wasps of the Province of Quebec" by Dr. Fyles; "Some interesting habits of Lepidopterous Larvæ" and "Notes on *Semiothisa Youngii*" by Mr. Gibson; "The Entomological Record for 1902" by Dr. Fletcher, and Mr. Harrington; "A Key to Orchard Insects," profusely illustrated, by Prof. Lochhead; "Notes on insects injurious to Pines" by Mr. Harrington; and "A talk about Entomology" by Mr. Moffat. The volume closed with a report from the North-west (Canada) Entomological Society and biographical sketches of Messrs. E. Baynes Reed and W. E. Saunders.

The *Canadian Entomologist* has been regularly issued at the beginning of each month. The 34th volume was completed in December last; it consisted of 339 pages, illustrated with three full-page plates and twelve figures from original drawings. The contributors numbered forty-seven and represented Canada, the United States, Germany and Russia. Of the 35th volume eight numbers have thus far been published, and the number for September will be issued immediately.

During the greater part of the year meetings for the study of Entomology have been held on Saturday evenings, alternately with those of the Botanical and Microscopical Sections. Owing to the unfavorable weather, very few collecting excursions have been made. The Ornithological Section has also held regular monthly meetings, but the Council much regrets that the Geological Section has suspended its operations for some months past. It is hoped, however, that its sessions will be resumed during the coming winter. The reports of the Branches, at Montreal, Quebec and Toronto, will be presented at this meeting, as well as those from the Sections and Officers, and will be published in due course.

The good work of the Society has been much extended by the delivery of lectures on subjects connected with the relations of insects with the various important industries of the Country. The President, Prof. Lochhead in addition to his official work as Professor of Biology at the Ontario Agricultural College at Guelph, has delivered many lectures at Farmer's Institutes and other meetings of farmers, horticulturists and fruit-growers. Dr. Fletcher has just completed two extensive series of farmers' meetings in the North West Territories and

British Columbia at all of which injurious insects were treated of to some extent. Prof. Lochhead and Dr. Fletcher among others have also taken an active part in developing the new Nature Study movement in the Educational Institutions of the Country. Mr. W. E. Saunders has continued to give interesting addresses on "The Birds of Canada" to meetings of teachers and others in various towns of Western Ontario, and Dr. Bethune has given a practical address to the market gardeners of London on some insects affecting their crops.

Judging from the frequent requests for our Annual Reports from teachers of our High and Public Schools, we believe that the work of this Society is appreciated by those who are trying to open up the wonderful field of insect life, and to understand the best ways of dealing with injurious pests.

We note with satisfaction the purchase by the Ontario Government of Dr. Brodie's large and valuable collection of insects. This collection can now be made available for study and reference, and should be a means of increasing the interest in Entomology.

All of which is respectfully submitted.

W. LOCHHEAD,
President.

REPORT OF THE MONTREAL BRANCH

The 249th regular and 30th Annual Meeting of the Montreal Branch of the Entomological Society of Ontario was held in the library of the Natural History Society, University Street, on Monday, May 11th 1903.

The following members were present: Messrs. Charles Stevenson (President), H. H. Lyman, A. E. Norris, M. W. Davis, A. Griffin, A. F. Winn, G. R. Southee, D. Brainerd and G. A. Moore.

The Chair was taken by the President and the minutes of the last meeting were read, and minutes of last annual meeting taken as read, and confirmed.

The President then read the following report on behalf of the Council:

REPORT OF THE COUNCIL.

The Thirtieth Annual Report of the Council of the Montreal Branch of the Entomological Society of Ontario:—

In presenting their annual report for the season 1902-3, the Council have much pleasure in congratulating the Branch on its having attained its thirtieth year of continuous existence.

During the season eight regular meetings have been held with an average attendance of eight, at one of which we had the pleasure of the attendance of Rev. Dr. T. W. Fyles, and the following papers were read:—

1. Annual Address of the President.....G. Chagnon.
2. What is a Genus?H.H. Lyman.
3. Notes on the season 1902.....Charles Stevenson.
4. Notes on the season 1902.....H. H. Lyman.
5. Random notes on Lepidoptera, 1902.....A. F. Winn.
6. A Wingless Fly.....Charles Stevenson.
7. Notes on Canadian Species of the Genus *Apanteles*
(*Arctia*) with special reference to the Larvae.....A. Gibson, Ottawa.
8. Wasps of the Province of Quebec.....Rev. Dr. T. W. Fyles.
9. The Stink bugs and their allies (*Pentatomidae*).....G. A. Moore.
10. A Few Days at Quebec.....A. F. Winn.
11. Pseudoscorpions.....Charles Stevenson.
12. A New Device for inflating Caterpillars.....D. Brainerd.

13. A Card System for Notes on Insects A. F. Winn.
14. Notes on Coleoptera.....Charles Stevenson.
15. A New Capsid, *Lygus Chagnoni*.....Charles Stevenson.
16. Additions to the Syrphidae of the Province of Quebec. G. Chagnon.
17. Further Notes on Haploa..... H. H. Lyman.
18. Lantern Exhibition of Lepidopterous slides..... A. E. Norris assisted by A. Griffin.

Three field days were held, twice to Piedmont in June and once to St. Hilaire in July. There was also good collecting done by the members individually at Trembling Mountain, Rigaud, Quebec, in Chambly, Laval and Rouville Counties as well as Montreal Island.

We have received two new members, Masters G. R. Southee and A. Denny.

For some time it was found difficult to fix an evening on which to hold the meetings. Your Council believe that the second Monday of the month has proved the most convenient to the members.

The Branch is greatly indebted to Mr. A. E. Norris for his care and guardianship of the Cabinet.

The finances of the Branch are in a satisfactory condition as will be shown in the Secretary-Treasurer's Report. But it will be seen by the Curator and Librarian's report there is not as much interest taken in the cabinet and Library as might be.

Respectfully submitted on behalf of the Council.

(Signed) CHARLES STEVENSON,

President.

The Treasurer then submitted his report, showing a balance of \$68.85. on hand

The Librarian and Curator then presented his reports, which showed that additions had been made to the Library by A. Griffin, H. H. Lyman, Charles Stevenson and the South London Entomological Society, and the first 10 volumes of the Canadian Entomologist had been added to the Library, several complete volumes and some incomplete ones being presented by Mr. Griffin and the other volumes and missing parts purchased and the whole bound in 5 volumes.

The following gentlemen had presented drawers to the cabinet, A. F. Winn 1, G. Chagnon 1, A. E. Norris 1, G. A. Moore 1, Charles Stevenson 1, H. H. Lyman 2, D. Brainerd 3 and M. W. Davis 1.

Mr. H. H. Lyman moved that the reports be received and adopted, seconded by A. F. Winn. *Carried.*

The President then read his Annual Address.

The following officers were elected for the coming year:—President, Charles Stevenson; Vice-President, D. Brainerd; Librarian and Curator, A. E. Norris; Secretary-Treasurer, Geo. A. Moore; Council, H. H. Lyman, G. Chagnon and A. F. Winn.

Mr. A. E. Norris then gave an illustrated talk on "Method of coloring photographic lantern slides of butterflies."

Mr. H. H. Lyman read a paper on "The Lepidoptera of Kirby's Insects of the Fauna Boreali-Americana."

Mr. H. H. Lyman exhibited a piece of wood, the property of the Natural History Society, showing marks probably made by a beetle.

It was then decided to hold an outing on Victoria Day, May 25th to St. Hilaire.

The meeting then adjourned.

GEO. A. MOORE,
Sec.-Treas.

REPORT OF THE QUEBEC BRANCH OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The annual meeting of the Quebec Branch was held on the 11th November, 1903, the President Rev. Dr. Fyles, occupying the chair.

The President read his report as follows ;

PRESIDENT'S REPORT.

The season of 1903 has not been a favorable one for Entomological pursuits. It began early at Levis : on April the 11th, at 3 o'clock in the afternoon, the thermometer stood at 82° in the shade, and *Pieris rapæ*, L. was to be seen at Dandelion heads. On Easter Day I saw a specimen of *Vanessa Atalanta*, L. on the wing. In May and the early part of June, the weather was intensely cold and dry ; and forest fires raged in many places around us. A lumbering establishment belonging to one of our members was burned at this time.

On the 3rd of June, I went to Bergerville, hoping to secure some female specimens of *Chionobas jutta*, Hubner, for my friend Mr. Newcomb of Boston, and to see what the prospects were for an agreeable outing for the members of our Branch. I found that the "Gomin" was not a *swamp*, but an arid waste of withered sphagnum, over which one walked as upon a Brussels carpet. There were no flowers, except a very few straggling blossoms of *Kalmia* and *Ledum*. To add to the strangeness of the scene, the air was thick with smoke through which the sun appeared like a copper disk. At length it was completely obscured ; and the gloom was like that of nightfall on a foggy day. Not a solitary *Jutta* was to be seen.

I walked down to the wharf at Sillery, and found that the boat could not run on account of the smoke ; so I turned and trudged along under the cliff till I came to Wolfe's Cove, where I climbed the ascent. I then crossed the Plains to the Street-car limits. My experiences on this occasion did not encourage me to ask the members of our Branch to hold a field-day.

The dry time was followed by a cold, wet, miserable spell during which out-door Entomological work was impossible.

Then a gloom was thrown over all our members by the death of that most excellent lady the wife of our kind Secretary-Treasurer Col. Lindsay. We grieve in sympathy with him and his family in their great loss.

The illness of Mr. George Addie obliged him and his family to leave Levis ; and, in consequence, we have lost from our members Miss Kate Addie, who was her father's faithful nurse. Mr. Addie died at Marbleton on the 3rd instant.

Concerning insects that have come under my observation during the season, the following particulars may be interesting :—

CASSIDA VIRIDIS, LINNEUS.

This species first appeared, this year, on the 29th of May, and continued in evidence till October the 21st. References to it will be found in the October number of the *Canadian Entomologist* for 1902, and in the January number of the same Magazine for the present year. The description I gave in the number for October, 1902 was correct. To it I would add,—the wings are somewhat smoky and have dark brown veins. The black abdomen has a yellow border on the upper side.

Concerning this species Dr. L. O. Howard, Entomologist to the U. S. Department of Agriculture, has kindly given me valuable information. He says :—

"Any leaf-feeder which has as wide a range of food plants as indicated by the burdock and thistle cannot be relied upon to be at all dainty in its diet, and may very readily become

an important enemy of cultivated crops, such as the beet for example, and the importation of such a beetle may be the cause of lasting regret in future years. Another Old World species, *Cassida nebulosa*, which normally feeds on various weeds, has been known to devastate large areas of sugar beets and is one of the most important enemies of the beet crop. These fears may be entirely groundless; nevertheless, the known food habits of near allies of this beetle go far to substantiate my fears. The food plants of *Cassida viridis*, Linn, have been noted by different writers.

According to Panzer, it feeds on Labiates; several authors record it on *Mentha*; Linnaeus, on *Lycopus*; Dr. Schmidt, on *Melissa officinalis*, *Nepeta* and *Salvia*, but *Cirsium arvense* appears to be the favourite food of larva and adult."

CIMBEX AMERICANA, LEACH.

In the lane leading from the Cove to the Plains of Abraham, on the occasion I have mentioned, I found, lying on its back, a remarkable specimen of *Cimex Americana*, Leach. I have in my collection the typical form, the larva of which feeds here upon the Alder, *Alnus incana*, Wild, also the *Cimex ulmi* of Peck (both the spotted and unspotted forms) which, by the by, feeds at Levis on the Paper Birch, *Betula papyracea*, Ait., and a variety in which, instead of spots, there are broad bands of yellow on either side, which almost meet at the top. But in all these varieties the wings are clear, or somewhat smoky, with a brownish border at the hind margin, whereas, the specimen I allude to has all the wings of a rich dark purple, like those of *Trogus Brullei*, Cresson, and *T. fulripes*, Cres. Can this be the *Cimex violacea* of St. Fargeau?

ALEYRODES VAPORARIORUM, WESTWOOD.

Last Winter two of our members, Miss Bickell and Miss Freeman, found their house plants badly infested by a new pest—a diminutive white fly, very delicate and beautiful, but very mischievous. It appeared in great numbers especially on plants of *Eupatorium* and *Fuchsia*. I made enquiries of several naturalists concerning this; and Mr. W. E. Britton, State Entomologist of Connecticut, very kindly sent me a copy of Bulletin 140, written by him, and issued from the New Haven Experiment Station. In this well written and beautifully illustrated bulletin much information concerning this species is given. Mr. Britton informs me that Quebec is the most northern locality from which the appearance of the insect has been recorded.

TORYMUS THOMSONI, NEW SPECIES.

In the first week of July my attention was drawn by my friend, Mr. Joshua Thompson of Levis, to a strange sight. The plum-trees in his grounds were infested with myriads of a new species of *Torymus*, as many as 30 of the insects appearing on one plum. I never witnessed anything, in my Entomological pursuits, more remarkable. The brilliant little creatures could be seen in the act of depositing their eggs; their ovipositors thrust deep into the fruit. Some of the plums attacked shewed signs of a previous attack by the *Curculio*, but most of them did not. Whether the larvae of the species feed on the flesh and juices of the plum, or attack the grubs of the *Curculio* I cannot say, for I was unable to follow the life-history of the species. The following is a description of the fly:—

Body a brilliant metallic green. Thorax punctate; prothorax rounded; meta-thorax large and elevated; scutellum arched. Trochanters and femora of the same colour as the body; the rest of the legs cerate; tibiae spurred; tarsi five jointed—the two last joints somewhat darkened. The antennae brown, clavate; scape, rather long; club three jointed. Eyes, oval, large and full, of a warm purple, with a pale rim, and set with short hairs; ocelli purple. Wings with short cilia, iridescent; vein of fore-wing widened where it bends to the costa

and for the rest of its length, bristly; the stigmal vein knobbed. Plates above and below the insertion of the wings purple. Ovipositor dark brown, stout, as long as the body. Total length of the insect three millimetres.

I may say that all the fruit attacked by this insect fell to the ground. I have named the species after Mr. Thompson who drew my attention to it.

SERICORIS AGILANA, CLEMENS.

In June I found a leaf-crumpling larva feeding upon the Meadow Sweet, *Spiraea salicifolia*, L. It was five lines in length, of a dark brown. The head was black; second segment, chestnut edged next the head with cream colour. The segments were surrounded with brown tubercles. The true legs were glossy black; the pro legs brown. On the body were a few bristles. The insect spun a close-fitting white cocoon which was wrapped in dry leaves. The moth, a beautiful little Tortrix, made its appearance on the 29th of the month. It was *S. agilana*, Clemens.

GRYLLUS DOMESTICUS, OLIVER.

In the 32nd Annual Report, page 93, I gave a short account of the male of this species. On the 7th of September, about 10 o'clock at night, a female of the species flew to the lamp on my table, and I was able to secure it. The dimensions of the insect were as follows: Length of body, six-tenths of an inch; length of antennae, eight-tenths; of ovipositor, four-tenths; of wing-covers, four-tenths. Total length of hind-legs, one inch.

The head was yellow with three dark brown bars across it. The eyes were oval, dark brown in colour, somewhat protuberant. The first joint of the setaceous antennae was large and yellow; the other joints were brown. The wing covers were the colour of fresh hay, with numerous cross veins somewhat lighter in colour. The under wings extended far beyond the body, and were closely pleated. The abdomen was brown with yellow markings. The ovipositor was brown. The femora were covered with a short pile; the tibiae, spined on both sides, and with longer spines at the tarsal joint. General appearance of the under side of the insect ochreous.

The males of the species commenced chirruping, in my house, on the 19th of the month.

WASPS.

In the Spring of this year a female *Vespa diabolica*, Saussure, formed its nest in the hollow wood work of one of the side posts of the steps leading to the front entrance of the residence of J. Simmons, Esq. one of our members. As the summer advanced this post presented a busy scene, with the constant in-coming and out-going of the workers. In August the male wasps appeared.

I have taken this season what I believe to be a specimen of *Vespa vulgaris*, Linneus. I can find no difference between it and specimens of the species sent to me from Paris, by M. du Buysson.

The nesting habits of some of our wasps are these:

V. vulgaris, *V. Germanica* and *V. rufa* form their nests in hollows in the ground.

V. areolaria, on stones etc., near the ground. *V. media*, under the eaves etc., of buildings.

V. maculata, suspended from branches of trees and shrubs.

LATE INSECT APPEARANCES.

On September the 16th, I took a fine fresh specimen of *Pieris cecilia*, Linn. on Levis Heights.

On the 21st of the same month, I saw fresh specimens of *Panorpa Archippus*, Fabr. and *Vanessa Antiopa*, Linn. on the wing at St. Bruno.

On Sept. 30th, I found, on the sidewalk of D' Auteuil Street, a female specimen of *Eetobia Germanica*, Stephens, carrying its egg-capsule, evidently seeking a fitting place in which to deposit it.

On November 4th at St. Romuald, I saw a neuropter on and a moth on the wing.

I have this season added two names to our Quebec list of Dragon flies, viz., *Sympetrum (Diplax) obtrusum*, Hagen, and *Sympetrum (Diplax) semicinctum* Say.

Even in a poor season then, things of interest to the naturalist come under our observation.

In conclusion I will express the hope that well-attended meetings of our Branch may be held regularly through the winter, and that we may spend many pleasant hours in the consideration of the wonders of the insect world.

Lt. Col. Lindsay said :

"Another remarkable fact noticed during the peculiar summer we had was that the insect pests that are so annoying to surveyors, lumbermen and fisherman in June and July were scarce this year. The midges which make life in our woods unbearable in July were hardly noticed : the large early mosquitoes came out earlier than usual and after their disappearance there were few of the smaller and more venomous ones. There were also few black flies but, on the other hand, these lasted until October, a thing never noticed before, according to lumbermen who had been in the woods for years."

The Rev. W. W. MacQuaig stated that the year had been a poor one not only for Entomological but also for Botanical research. He had noticed that the Fungi especially had been scarce. In the season for *Gasteromycetes* not a puff-ball was to be seen.

The Secretary Treasurer also submitted his report which was adopted.

The following officers were elected :—President, Rev. Dr. Fyles ; Vice-president, Miss E. MacDonald ; Council, Hon. R. Turner, Rev. W. W. MacQuaig, Mrs. R. Turner, Miss Bickell, Miss Freeman ; Secretary-Treasurer, Lt. Col. Crawford Lindsay.

The list of members now shows 23 adults and 3 juniors.

REPORT OF THE TORONTO BRANCH.

At the Annual Meeting of the Toronto Branch of the Entomological Society of Ontario, held in the Education Department Building on May 1st, 1903—the president Mr. E. M. Walker in the chair, the following Report for the year 1902-3 was read by the Secretary.

During the past year, eight meetings have been held, and the following papers have been read before the Society:—

- "Algonquin Park from an Entomologist's standpoint" E. M. Walker.
- "The Milkweed Butterfly" H. H. Lyman.
- "An Assam Danais ; and its Mimics" Chas. Stevenson.
- "Toronto Butterflies in 1902" J. B. Williams.
- "How to popularize Natural History, especially Entomology" . . Paul Hahn.
- "The genus *Polisma* in Eastern North America" E. M. Walker.

One meeting was occupied with an "Exhibition of Specimens"

Our December meeting, when Mr. Lyman read his paper on the Milkweed Butterfly, was a very successful one, a number of the Natural History Society members attended, and in addition to his paper Mr. Lyman gave us an extremely interesting account of the occurrence of the Ghost Moth (*Hepialus thule*) in and around Montreal, and of the efforts made to secure specimens.

A few members went to High Park on the 24th of May ; and it was intended that we should join the Natural History Society in an excursion to Black Creek on July the 26th, but the weather, unfortunately, prevented any such excursion from taking place.

Mr. James McDunnough, a former member of the Society, now living in Europe, has presented us with a large cabinet of Lepidoptera, and a small cabinet of Coleoptera,—all collected some years ago while he resided in this country. Thirteen drawers of the large cabinet contain North American Lepidoptera, and six of them are filled with a very good series of European butterflies and moths.

Mr. Walker has presented us with his collection of Beetles and is arranging them in the Museum drawers, with those that are already in the collection. Mr. Maughan and Mr. Williams have also presented some specimens to the Museum.

As in previous years, we subscribed for the "Entomological News"—the Bulletins of the New York State Museum, and the "Journal of the New York Entomological Society," and as our funds were rather low our President has kindly supplied the means for continuing our subscriptions to this last named Journal, for the present year.

Papers on Entomological subjects have also been received from the Central Experimental Farm at Ottawa, the United States Department of Agriculture at Washington, from Cornell University, and other sources.

Four new members have been added to our roll during the year, and we have not had any resignations; our recent meetings, also, have shown a gratifying increase in the average attendance; and we feel sure that the Branch will go forward, and prosper.

(Signed) E. M. WALKER, President.

J. B. WILLIAMS, Secretary.

TORONTO, May 1st, 1903.

The following officers were elected for the ensuing year;—President, Dr. E. M. Walker; Vice President, Paul Hahn; Secretary-Treasurer, John Maughan jr.; Librarian and Curator, J. B. Williams; Members of Council, J. H. Webb, G. M. Stewart, and W. J. Fraser.

REPORT OF THE TREASURER.

Financial statement of the Treasurer of the Entomological Society of Ontario for the year ending August 31st 1903.

RECEIPTS.		EXPENDITURE.	
Cash Balance September 1st, 1902.....	\$414 18	Printing, etc.....	\$700 30
Subscriptions	377 94	Expense, Annual Meeting and Reports.....	323 60
Proceeds from sale of Pins and Cork.....	36 12	Salaries	375 00
Advertising	37 75	Rent	175 00
Sales Entomologist and Reports.....	83 15	Library	9 03
Government Grant.....	1,000 00	Expenses—Sundry	50 17
Interest	7 30	Insurance	30 00
		Balance	293 34
Total.....	<u>\$1,956 44</u>	Total.....	<u>\$1,956 44</u>
Auditors: { W. H. HAMILTON. S. B. MCCREADY.		Treasurer: JAS. H. BOWMAN.	

REPORT OF THE LIBRARIAN AND CURATOR.

For the year ending August 31st 1903.

The number of bound volumes received during the year was seventeen. Three of them were contributed by Dr. Bethune; one of which was Prof. Otto Lugger's 5th Annual Report of the University of Minnesota, which was wanting in the Society's Library.

Twenty-five were otherwise added to the Library two of them, contributed by Dr. Fletcher, being the last two volumes of the American Association for the Advancement of Science, to maintain the series. Making a total of forty-two volumes added during the year.

The full number now on the Register is 1804. Number of books loaned during the year, Ten. Several valuable additions have been entered upon the accession list of native insects

during the year. The most important of which is a perfect specimen of that rare and interesting Stalk-boring noctuid *Hydræcia appassionata*, Harv, contributed by Mr. H. Bird, Rye N. Y. The first specimen of this attractive moth was taken at London Ont. and named and described by Leon F. Harvey in the "Canadian Entomologist" Vol.viii, Page 155, 1876, and is now to be seen in the British Museum collection.

Some highly interesting specimens of Carpenter Bees and their work, were contributed by Mr. C. T. Ramsden, Cuba.

Respectfully submitted,

J. ALSTON MOFFAT,

Librarian & Curator.

REPORT OF THE BOTANICAL SECTION.

The Botanical Section of the Entomological Society of Ontario met for organization on the 2nd of May, 1903, when the following officers were elected for the ensuing year:—Chairman, Mr. J. A. Balkwill; Vice-Chairman, Mr. S. B. McCready; Secretary, Master H. C. Rennie.

Eight regular fortnightly meetings were held during the season at which there was a satisfactory attendance both of members and visitors. Owing to unfavourable weather no field-excursions were made.

At all the meetings a number of interesting plants were exhibited and examined, Mr. Balkwill and Mr. Bowman being the chief contributors. Though no papers were read, great interest was maintained at all the meetings and much practical information regarding the plants in the neighborhood of London was given.

H. C. RENNIE,
Secretary.

J. A. BALKWILL,
Chairman.

REPORT OF THE MICROSCOPICAL SECTION OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO

The Microscopical Section of the Entomological Society of Ontario takes pleasure in presenting its thirteenth annual report.

The re-organization meeting was held on the Eighteenth of October, 1902, when the following officers were elected :—

Mr. C. W. Horton.....	Chairman.
Mr. R. W. Rennie	Vice Chairman.
Mr. N. Beale.....	Secretary.

Mr. C. E. Parsons was subsequently elected Secretary in the unavoidable absence of Mr. Beale.

During the past winter (the Microscopical Section resolves into the Botanical Section during the summer months) fourteen regular meetings were held, with an average of ten members, as well as visitors. One of the meetings was given up to the exhibition of interesting microscopical objects at a *Conversazione* of the "Daughters of the Empire." A similar exhibition was made at the annual *Conversazione* of the Western University at Huron College.

From time to time throughout the season papers were read or addresses given on the following subjects:

The Habits of the Ant Lion and its Larvæ	Prof. Dearnass.
Pond Life.....	Rev. C. T. Scott.

Mounting Desmids.	Prof. Bowman.
Movements of Protoplasm in Chara.	Prof. Bowman.
Structure of Volvox.	Prof. Bowman.
Bacteria, their culture and methods of mounting.	Dr. Stevenson.
Crystallization of Monobromide of Camphor (shown with a Projection Lantern and Polariscopes).	Profs. Bowman and Deurness.

At nearly all the meetings many specimens of interest and beauty were exhibited and discussed, in addition to those which formed the subjects of papers.

All of which is respectfully submitted.

C. E. PARSONS,
Secretary.

C. W. HORTON,
Chairman.

ANNUAL REPORT OF THE McILWRAITH ORNITHOLOGICAL CLUB.

(THE ORNITHOLOGICAL SECTION OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.)

In consequence of the early termination of the current year and of other unavoidable circumstances, the Club has held only five meetings since our last Report; the average attendance has been over seven.

The members of the Club offer their thanks to the Society for the permission to change its title to "The McIlwraith Ornithological Club." A letter was received from Dr. K. C. McIlwraith, of Toronto, thanking the Club for this compliment to his father, Mr. Thomas McIlwraith, whose lamented death took place only a few months later. A resolution was placed on the minutes of the Club expressing the regret and sympathy of all its members and a copy was sent to Mr. McIlwraith's family.

The death of Mr. Robert Elliott, which occurred a few weeks before that of Mr. McIlwraith, is a severe loss to the Club. Although not a regular attendant at the meetings, owing to his residence being at some distance from the city, he was always deeply interested in the work of the Club and contributed some able and well written papers to its proceedings. He was probably the best all-round Naturalist in this neighbourhood, being well versed in Ornithology, Botany, Geology and Entomology, and was also without a peer among the local students of Mammalia. The following resolution was adopted by the Club:

"Resolved that we, the McIlwraith Ornithological Club, desire to place on record our sense of the loss sustained by ourselves as a Club and by scientists in Canada as a whole, through the death of our esteemed member Robert Elliott. For most of us he occupied the place of a personal friend and he was an inspiration to us all by reason of his acute observation, his careful notes, and particularly by his accurate and painstaking work on any species or varieties that were at all obscure or difficult; and his influence will live long among us, an encouragement and incentive to the best work."

The following papers were read at the meetings: A Red-shouldered Hawk in captivity, Roger Hedley; Nesting of the Hudsonian Chickadee and the Brown Creeper, L. McI. Terrill; My pet Crows, L. H. Smith; Nesting habits of the Cerulean Warbler, W. E. Saunders.

These papers, have, as usual, been sent to the "Ottawa Naturalist" for publication.

Rev. C. T. Scott exhibited photographs illustrating some remarks on his trip from the Georgian Bay by canoe to the Canadian Pacific Railway through lakes and rivers and over portages, returning by the Wabigoon River.

Mr. James B. Boutellier contributed a long and interesting report on the migrations of birds at Sable Island.

Records of migrations at London were kept and, until the May meeting, were recorded by the Club, 74 migrants having been observed up to May 8th, the date of the last spring meeting.

One meeting was held by invitation at the residence of Dr. MacCallum, Superintendent of the London Asylum; after transacting some formal business, the evening was spent in examining and discussing his large and interesting collections.

A noteworthy feature of the year's observations was the large number of eggs laid by the earliest Hawks, 5 sets of the Red-tailed Hawk, 3 of three eggs each and 2 of four eggs, being shown at the April meeting, less favourable conditions prevailed later on and the Red-shouldered Hawk yielded two sets of only two eggs, the sum total not being above the average.

The Club has been sorry to lose the presence and help of Mr. Harry Gould, one of our most active workers, who has removed to Alberta; some interesting notes are expected of his observations in this new field.

During the year addresses and lectures on Ornithological subjects have been delivered by members to the following audiences: The Literary Society of the Baptist Church, Sarnia; The Baconian Club, London; The Nature Study Class of the Collegiate Institute, Woodstock; The Ladies Literary Club, Woodstock; The Moulton Ladies College, Toronto, and several Societies in London.

On the whole the Club looks back upon a successful year, full of interest, though saddened by the losses mentioned above. We hope that an interesting and valuable share of work will be accomplished before the next report comes to be written.

W. E. SAUNDERS,
Secretary.

REPORT FROM THE ENTOMOLOGICAL SOCIETY OF ONTARIO TO THE ROYAL SOCIETY OF CANADA.

THROUGH THE REV. C. J. S. BETHUNE, D.C.L., DELEGATE.

In giving a report of the doings of the Entomological Society of Ontario for the past year—the thirty-ninth since its foundation—it will not be necessary to recount the various forms of work undertaken by its members, as these were fully described last year and no important changes have since been made in its methods of procedure. It will be sufficient to give some particulars respecting its publications and a brief account of the annual gathering of its members at the head-quarters in London.

The *Canadian Entomologist*, the monthly magazine of the Society, is now in its 35th year of publication. The volume for 1902 contains 339 pages, and is illustrated with three full-page plates and twelve figures from original drawings. The contributors number forty-seven and represent Canada, the United States, Germany and Russia. The principal articles may be grouped as follows: Descriptions of new genera, species and varieties in lepidoptera by Prof. J. B. Smith, Dr. H. G. Dyar, Mr. Henry Bird, Prof. A. R. Grote, and Mr. A. G. Weeks; Orthoptera by Messrs. E. M. Walker, A. N. Caudell, and J. A. G. Rehn; Hymenoptera by Prof. T. D. A. Cockerell, Messrs. W. H. Ashmead, E. S. G. Titus, Charles Robertson, J. C. Crawford, W. H. Harrington, H. L. Viereck and J. C. Bradley; Hemiptera-Homoptera by Prof. T. D. A. Cockerell, Messrs. E. D. Ball, G. B. King and E. M. Ehrhorn; Neuroptera by Prof. J. G. Needham and Mr. N. Banks; Coleoptera by Prof. H. F. Wickham, and W. D. Pierce; Diptera by Messrs. D. W. Coquillett and C. W. Johnson, and Prof. Cockerell; and Acarina by Mr. N. Banks. Forty-one new genera are described, 176 new species and 12 new varieties and sub-species.

Papers on Classification and Systematic Entomology: Notes on Lepidoptera by Mr. H. H. Lyman, Dr. H. G. Dyar, Professors Grote and J. B. Smith, and on the genus *Catocala* by Prof. G. H. French; the Wasps of the Super-family Vespidae by W. H. Ashmead; Ontario

Acrididae by E. M. Walker; Coccidae by Mrs. Fernald; Bombidae by Prof. Cockerell; Halictinae by Mr. C. Robertson; Orthoptera by Mr. J. A. G. Rehn; and an article on the scientific name of the Cherry Fruit fly by Prof. M. V. Slingerland.

Life-histories are given with more or less completeness of the following insects: The Variable Cut-worm (*Mamestra Atlantica*) by Dr. Fletcher and Mr. A. Gibson; *Arctia virgo* and *phalerata* and *Penthina hebesana* by Mr. Gibson; several species of *Hydroecia*, illustrated by a beautiful coloured plate, by Mr. Henry Bird; *Lycaena Scudderii* by Mr. H. H. Lyman; *Corethra Brakeleji* by Prof. J. B. Smith; *Lyda fasciata* by Mr. R. F. Pearsall; the egg of the Water-scorpion (*Ranatra*) by Mr. R. H. Pettit; and the larva of a *Datana* by Dr. Kunze. Collecting notes, containing observations of much interest, are given by Mr. E. F. Heath on Manitoban Lepidoptera; Mr. W. H. Harrington on Coleoptera; Mr. E. D. Harris on Cicindelidae; Mr. Geo. B. King on Coccidae and the Rev. Dr. Fyles records the capture near Quebec of a Tortoise beetle new to Canada.

Among the miscellaneous papers may be mentioned a discussion on labels for specimens; "What is a genus?" by Mr. H. H. Lyman; "The formation of generic names," by Prof. J. M. Aldrich; "The ecology of Insect Sounds," by Mr. Frank E. Lutz; and an account of the changes in the insect Fauna of northern Illinois by Prof. F. M. Webster.

The thirty-ninth annual meeting of the Society was held in London at the end of October last. Its proceedings were opened by a conference on the Destructive Pea-weevil, which has caused an immense amount of loss in the Province of Ontario during the last few years. The discussion was opened by Dr. Fletcher, who gave a full description of the insect and the ravages it commits, its distribution and the best methods of controlling it; other speakers were Prof. Lochhead, Mr. Pearce, Mr. Fisher and Prof. James, Deputy Minister of Agriculture for Ontario. Resolutions were adopted regarding the diffusion of information among the community, and requesting the Provincial Government to send a competent staff of men to the rural districts of the country whose duty it should be to give the farmers practical lessons on the best methods of eradicating the pest.

Mr. George E. Fisher, the Provincial Inspector of Scale Insects, gave a report on the insects of the year in the Niagara and Hamilton districts, and described his experiments with the lime and sulphur wash for the destruction of the San José Scale, and their successful results.

At a public meeting in the evening the Rev. Dr. Fyles read his presidential address on "Insect Life," illustrated by a series of beautiful coloured diagrams that he had himself prepared; and Prof. Lochhead gave a lantern lecture on "Some Noted Butterfly-hunters and some Common Butterflies."

The proceedings at the several sessions of the meeting and the papers read are given in full in the thirty-third Annual Report of the Society, which was published by the Ontario Department of Agriculture in March last. It consists of 132 pages, illustrated with 108 engravings in the text and photogravure portraits of Mr. E. Baynes Reed, one of the original members of the Society and for many years one of its most active officers, and of Mr. W. E. Saunders, the present energetic Secretary. Reports are given from the various Officers and Sections and the branches at Montreal, Quebec and Toronto, and also from the North-West (Canada) Entomological Society.

Among the papers read may be mentioned the valuable reports on the insects of the year in their districts by the Directors, Messrs. C. H. Young, Ottawa; J. D. Evans, Trenton; E. M. Walker, Toronto; G. E. Fisher, Hamilton and Niagara; and J. A. Balkwill, London. These are supplemented by further notes on the season by Messrs. C. Stevenson, J. A. Moffatt Prof. Lochhead and Dr. James Fletcher. Mr. Lyman contributed a paper on the remarkable habits of the Archippus butterfly, and the points in its history on which further information is

required. Dr. Fyles furnished an article on "The Paper-making Wasps of Quebec; Mr. A. Gibson on "Some Interesting Habits of Lepidopterous Larvae," and an account of *Semiophora Youngii*, a new enemy of tamarac and spruce trees; Mr. Harrington, "Notes on Insects Injurious to Pines;" Prof. Lochhead, an illustrated "Key to Orchard Insects;" Mr. Moffat, "A Talk About Entomology;" and Dr. Fletcher and Mr. Harrington the very valuable "Entomological Record for 1902."

REPORT ON INSECTS OF THE YEAR.

DIVISION NO. 1.—OTTAWA DISTRICT.—BY C. H. YOUNG. HURDMAN'S BRIDGE.

The season of 1903, as far as the writer has been able to observe, has not been a very remarkable one as regards insect pests. Some of the well known enemies of the farmer were, it is true, somewhat abundant, but with the exception of about three different pests, I have not detected much serious damage to vegetation of any kind. The season has been an exceptionally damp and cool one, and undoubtedly, this explains the absence on the whole of special outbreaks of injurious insects.



Fig. 1.

Early in the season the Onion Maggot (Fig. 1) was very abundant, and caused considerable damage throughout this district. This insect like all the root maggots is very difficult to treat. A remedy which has given good results particularly in gardens is the sprinkling of the plants directly they appear above ground with a preparation containing some form of Carbolic acid. Dr. Fletcher recommends the following mixture: Take two quarts of soft soap and boil in rain-water until all is dissolved, then turn in one pint of crude carbolic acid. When required for use take one part of this mixture with fifty of water and when well mixed together sprinkle

with a watering-can, or spray directly upon the plants.

Cutworms were abundant in May and June and caused serious damage to cabbages and other plants when first put out. The species which was most abundant was the Dark-sided Cutworm of Riley, *Carneades messoria*. The poisoned bran remedy which consists of simply ordinary bran and Paris-green in the proportion of 50 lbs. of the former to one of the latter has given splendid results, particularly in gardens. The bran should first be moistened with sweetened water, and the Paris green then added.

The Plum aphid (*Aphis prunifolii*) was the cause of much damage in the Ottawa District. These plant-lice swarmed on the trees in June and serious injury was done in many orchards. The remedy for these insects is to spray the trees when the aphides are first noticed, before they cause the leaves to curl, with whale-oil-soap, 1 lb. in 5 gallons of water, or kerosene emulsion of the usual strength 1 to 9 of water. The Currant saw-fly (*Nematus ribesii*), was rather more than usually abundant during the past season, and stripped the foliage of many bushes in gardens near Chelsea, Q. and north to Meech's Lake.

On the whole the collecting season must be characterized as poor, owing to the very unfavourable weather.

The month of August, however, was better and during that month, I had very fair results with "sugar." One interesting capture which is worthy of mention is of a specimen of "*Erebos edora*." Many other noctuids were taken, some of which are shown at the meeting to-day.

This collection contains not only many additions to the Ottawa list but also many specimens of species which had been taken rarely before. The most remarkable species of the year's collection is the beautiful little Hairstreak butterfly *Thecla lula*. Other collectors in this district have worked energetically during the season and several good captures have been made. I am glad to notice a growing interest in the good work of rearing species from the egg and making notes on all the preparatory stages.

DIVISION NO. 2—MIDLAND DISTRICT. BY C. E. GRANT, ORILLIA.

I feel rather disappointed that the season of 1903, as well as that of 1902, should have been decidedly off years for the entomologist as, having had the honor of being appointed a Director of the Society, I should have liked to have made my report interesting. I have taken quite a few species new to my cabinet in the last two years—a great many not named; some things as *Plusia balluca* and *aereoides* appeared very common this year, usually two or three only being taken in the season. The following notes have been made in reference to noxious insects:

Nematus ribesii. The imported Currant Worm, usually very destructive, No spring brood noticed even on unsprayed bushes and very few appearing in midsummer.

Tremex Columba, (the Pigeon Tremex). This insect is responsible for killing quite a number of fine maple-trees in town, though the attack has been probably induced by too heavy and injudicious pruning, causing the bark to split and a certain amount of rot to ensue.

Phorbia ceparum, (Onion Maggot). This insect was noticed to be very common in seed onions.

Doryphora decemlineata, (the Potato Beetle). Early brood scarce, second brood more plentiful. This insect is not allowed to gain headway in this vicinity, Paris Green being freely used.

Oberca maculata, (Raspberry Cane-borer), rather abundant amongst cultivated raspberries. The drooping tips of the canes were very noticeable.

Carpocapsa pomonella, (the Codling Moth). This apple pest appears to defy all remedies and weather; it appears regularly every season and in numbers.

Cut worms have been complained of and most of their moths are appearing plentifully, but *Hadena arctica* and *Leucania unipuncta* are almost rare.

Pieris rapae, (the Cabbage Butterfly). This insect also seemed to be as scarce as an ordinary *oleracea*. *Protodice* has not been seen for six years.

Bruchus pisorum, (Pea Weevil). On investigation I find that this part of the country is not badly infested with this insect, but I have come across an odd specimen or two in peas grown here.

Clisiocampa Americana, (Tent Caterpillar). Apparently the wet weather in June of the last two years has been too much for this insect as the moths do not show up at light except in isolated specimens.

Eudiotis hyalineata. This insect has been taken by me rather plentifully the last two falls—first taken about five years ago.

Protoparce celeus, (Tomato Hawk-moth). No signs of this pest this year; moths and caterpillars were numerous in 1901. I had dozens of the moths brought to me at my office suspected of almost any offence in the calendar.

I have taken some nice things in the last two years—*Crambodes talidiformis*, *Cosmia paleacea*, *Ipinorpha pleonectusa*, *Plusia mappa*, and two new *Plusias* not named, making nineteen varieties of this family taken in Orillia.

DIVISION No. 5—LONDON DISTRICT BY J. A. BALKWILL.

In this district I have not heard of any serious damage from insects that frequently appear in large numbers, but we have had the different species of Aphis in great quantities early in the season on very many kinds of shrubs, causing a considerable injury later on; there was a very perceptible decrease in their number, I have no doubt owing to the destruction of them by the larvæ of the Ladybirds which were observed on many of the plants infested.

The Potato Beetle (*Doryphora decemlineata*) appeared in large numbers as soon as their food plant appeared above ground and caused some damage, but it was generally remarked that in a short time their numbers had become very much decreased from what cause I cannot say, as their destruction by the usual methods of applying Paris Green was not more commonly done than usual.

The Cottony Maple Scale has again appeared in numbers sufficient to cause anxiety among the lovers of our beautiful maple trees, but we are in hopes that its natural enemies will keep it in check as in former visitations.

The Asparagus Beetle (*Crioceris 12-punctata*) appeared in increased numbers in the northern part of the City of London, but has not spread as much as we were told to expect. I have searched for it in the southern part and could not find one beetle on several beds visited.

Complaint was made in one or two cases of tomato plants being bored by some grubs and on examination I found the larva of what I believe to be *Hydrea cataphracta*. Only one of the larva was secured and that died before it reached the pupal stage; this is the first time that this has been observed in our neighborhood, so far as we have any record.

Very few peas were grown in this vicinity and were generally sown late so that it is too early for a full report on this crop. In Oxford County I have heard that the crop is badly infested. Would not this be a favourable time to treat all the peas, as the quantity is small and the expense would not be a serious item?

Very few of the apples in this part of the district are damaged by the Codling moth. The cool weather just after the fruit had set would probably account for a diminution in their number. The plums also have not been so much injured by the Curculio, and although bitten by the insect no larva could be found inside a considerable quantity examined from trees where no spraying was done.

The Cigar Case-bearer (*Coleophora Fletcherella*) were very numerous on the leaves of the apple, but the insect being so small the injury was not perceptible.

The presence of the Eye-spotted Bud-moth (*Tmetocera*) could be plainly seen in the orchards by the leaves at the ends of the twigs being dead and drawn together by the web of the insect.

No injury from the Dry Clover-moth (*Asopia costalis*) was found in the barns where it was so abundant the winter before.

In the discussion which followed the reading of the Directors' reports, Prof. Lochhead stated that the 12-spotted Asparagus beetle was very prevalent through the Niagara Peninsula and was travelling gradually westward and northward; at Guelph it was already very abundant. The other species (*Crioceris asparagi*) was causing much damage to the plants in St. Catharines and Hamilton but was not spreading over the country to the same extent. Both kinds will require to be watched and promptly treated wherever they establish themselves. Dr. Howard said that it would be interesting to ascertain whether the Asparagus beetles spread beyond the Upper Austral Belt, the boundary of which extends from Niagara through Hamilton and London to Detroit—Prof. Lochhead in reply said that they had not been found further north than Guelph which is in the Transition Zone just beyond the Upper Austral.

With regard to Cut worms, referred to by Mr. Young, Dr. Bethune stated that they appear to have been very abundant all over the country during the past season. He had received a communication from Mr. Boulter, of Tryon, Prince Edward Island, who complained

of the injuries caused by them to turnips and mangels especially, and also to grain crops and potatoes; in some instances the injury to the young plants was so great that the farmers were compelled to plow them up and put in some other crop. The speaker had recommended the employment of the poisoned bran mixture, which had been used with so much success last year in British Columbia.

The Onion maggot was referred to by several speakers, who reported its prevalence all over the Province, and expressed their gratification that Dr. Fletcher had found an effective remedy in the use of carbolic acid, as described by Mr. Young.

The Codling worm was next discussed. Prof. Lochhead had found that much mischief has been caused by the careless use of burlap bandages. Many fruit-growers were actually cultivating the worm by allowing it to find a secure hiding place for the performance of its transformations beneath the burlap; they seemed to think that all they had to do was to put on the bandages early in the season and leave them to do the work of extermination. If the bandages were not regularly and frequently taken off and the worms and chrysalids destroyed, much more harm than good was done. Some farmers said they were too busy to do this; if such were the case it would be better not to bandage the trees at all. Others seemed to place entire reliance upon the burlap and gave up spraying their trees, with rather disastrous results.

Dr. Howard said that the Codling worm conditions in Ontario were the same as in the north-western states. It had been contended that no success could be achieved there with the remedies that had been found effective in the east. Accordingly the life-history of the insect had been carefully studied in Idaho in order to test this theory. It was found that there were two broods, and that the second brood of worms fed upon the leaves of the trees first and then attacked the fruit. An orchard of 3,000 trees near Boise City had been made use of for a large scale experiment; the majority of the trees were sprayed first and then bandaged with burlap. In the autumn the crop was examined and it was found that the loss on the trees which had received no treatment was from 70 to 90 per cent. of the fruit, while the trees which had been banded and sprayed yielded from 90 to 98 per cent. of perfect fruit. The effect of this object lesson was that the fruit-growers in that neighbourhood are now enthusiastic about the treatment and are preparing to equip themselves with spraying apparatus for next year. Gasoline power sprayers are being employed in large orchards and are found very satisfactory.

Prof. Lochhead stated that he found two broods of the Codling worm at Guelph. He then gave an account of an experiment at Simcoe, where Mr. Johnson had taken a large neglected orchard, thoroughly pruned and cleaned the trees and then sprayed them three times during the season. The result was that he had a fine crop, ninety per cent. of the fruit being free from worms and scab. In a neighboring orchard where no spraying or other treatment was done, the crop was an almost complete failure and the loss was estimated to reach three thousand dollars.

Papers were then read by Dr. Bethune on "A Menace to the Shade trees of London, Ontario"; by Mr. H. H. Lyman on "Two remarkable aberrations (Lepidoptera)," who exhibited the specimens referred to; and by Mr. Stevenson, in the absence of the author, on "Additions to the list of Syrphidae of Montreal" by Mr. G. Chagnon. The meeting then adjourned.

EVENING SESSION.

A public meeting of the Society, to which the members of the medical profession in Ottawa were specially invited, was held in the hall of the Normal School, on Thursday evening, Sept. 3rd, by kind permission of the Principal. At 8 o'clock the chair was taken by Dr. James Fletcher, who after a few introductory remarks, called upon Professor Lochhead to deliver his address as President of the Society.

PROGRESS OF ECONOMIC ENTOMOLOGY IN ONTARIO.

(Annual Address of the President.)

By WM. LOCHHEAD, B.A., M.S., PROFESSOR OF BIOLOGY, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

MR. CHAIRMAN, LADIES AND GENTLEMEN,—This is not the first time that our Society has held its meetings in your City. This is the fifth occasion, but the fourth was in 1889—14 years ago. We are celebrating our 40th year. If age counts for anything in a Society's history, we should possess a certain amount of wisdom; we are old enough to be wise, yet how many of the people whom we try to help would consider us filled with the spirit of wisdom if they happened to see us, young and old, chasing bugs and butterflies over meadows, and across cultivated fields? In all real scientific investigation there is much apparent senseless (to the superficial, casual observer) but necessary work. The real work is long and often laborious, and done frequently while others sleep.

On occasions of this kind when scientists from Ontario and her sister provinces meet to discuss entomological problems it is the privilege of the President to review the work which has been done not only in Ontario, but also in the larger scientific world outside. It is always well to know what our neighbors are doing in the different fields of scientific research, lest we fall into a rut, become self-satisfied, and make but little progress. I shall not presume to review the progress of Entomology throughout the world, for that would require volumes, but I shall confine my remarks to the much smaller task, viz, the progress of Economic or Applied Entomology in Ontario.

There are gentlemen in this Society who are more capable than I of bringing before you the progress of Economic Entomology in Ontario. I refer to gentlemen like Dr. Bethune, Dr. Saunders and Dr. Fletcher, who have served this Society faithfully; who have ever kept themselves in the foreground where the hardest hits are received and given; who have experimented and toiled that the husbandman might have greater returns; and whose achievements are the records of the progress which I am about to record.

When we consider the status of applied Entomology to-day, and contrast it with that of a generation ago, we cannot help being impressed with the magnificent strides that have taken place. To-day Economic Entomology has a place among the other applied sciences, and the farmer, gardener, and fruit-grower appeal to the economic entomologist with confidence in the results. To-day Entomology is being taught in many of our schools, not perhaps as a systematic science, but as a most valuable Nature-Study; and the life-histories of many of the most common insects are being worked out every year by hundreds of eager, enthusiastic nature-students. To-day chairs of Entomology are established in our larger universities, and corps of trained entomologists are maintained by the most advanced governments of the time.

This change has not taken place all at once, as if by magic, but by slow, almost imperceptible, degrees. Entomology possesses no magic wand to command the attention of the workers of the soil and the cultivators of the crops of the soil, who are by nature not given to a hasty adoption of new-fangled ideas. By patient, pains-taking work the student of insects has gained the ear of the government and the people. Credit will never be given to the thousands of modest workers who worked for the love of investigating, and who did not look for the applause of the public. In the pages of annual reports, in magazines, in agricultural papers, and in the unpublished note-books in some obscure office, will be found the results of the work of the noble band of workers. Our own Canadian band did much to hasten the time when the people would recognise the work of entomologists by listening gladly to their words of advice in times of stress. Not only did our Canadian workers add to our knowledge by the publication of original observations, but they also kept close watch over the work of the ento-

mologists across the line in the United States, and were able to take advantage of any good remedial treatment as soon as the announcement was made in the United States. Our older observers kept in close touch with the best observers in the United States, by personal correspondence about the insects of their respective districts.!

When one attempts to give the history of Economic Entomology of Ontario he is disposed to divide the time into Epochs. The first Epoch we may term the *Primary Epoch*, inasmuch as the first settlers were but little troubled with insect pests; the country was but sparsely settled; and no notice was taken of the toll levied by the insect marauders, if there were any. This Epoch extended from the first settlement of the Province up to 1850.

The second Epoch may be called the *Secondary Epoch*. The sons of the early settlers had now control of the best farms of the Province; another lot of settlers was pouring in from the Old Land to occupy the newly-surveyed townships, and the farmers of the older districts for the first time felt the attacks of injurious insects. It was the Epoch when the Wheat Midge, the Hessian Fly, and the Pea-Weevil caused almost wide-spread destruction of the farm crops. It was the Epoch when the Legislature of the day was compelled to take cognizance of Entomology, and to offer prizes for the best written Essays containing the best remedial treatment against these insects. Too little was known as to the life-histories of insects in general, and of these pests in particular, to expect much from these pioneers in applied entomology; but the importance of this governmental encouragement was that attention was strongly drawn to the fact that there were remedies against insect pests as there were against the ailments of man and beast. Entomological workers were encouraged to continue their work, for they saw official recognition of their best labors. As a result of this we have no doubt the founding of the Entomological Society of Ontario in 1863 by a small band of devoted and enthusiastic young men who had faith in the future. We have but two or three members of this first lot left, but we admire them for the amount of work which they have done, for the way they have gradually won the recognition of the Legislature and the people. This Epoch extends from 1850 to 1875.

The third Epoch may be called the *Tertiary Epoch* of the Entomological history of the Province. The chief characteristic of this Epoch is the introduction of remedial measures founded upon a fairly complete knowledge of the insect pests of the farm, orchard and garden. The early seventies saw the gradual introduction of Paris Green as a poison for mandibulate or biting insects, but it required many years of patient experimentation to determine the best proportions to use, and the best methods of applying the substances to the insect and the plant. Later, London Purple was tried as a substitute, but it has not held its own with Paris Green, from the fact that its composition was liable to considerable variation in the amount of soluble arsenic.

This Epoch saw also the introduction of kerosene emulsion against sucking insects, and Bordeaux mixture to control fungous diseases.

Coincident with the adoption of these new insecticides was the development of machinery and apparatus for the application of the insecticides. The history of spraying machinery forms a very interesting chapter in Economic Entomology, but I shall not deal with it here. Suffice it to say that the success of the investigations of to-day may be largely attributed to the excellent appliances which are at our disposal.

This was the Epoch of experimentation along scientific lines, for the studies of the previous Epoch had made us ready for such work.

This Epoch extends from 1875 to 1900, and we have now entered upon another, which may be termed the *Quaternary*. It is hard to surmise what the future has in store for us in the way of improvements in applied entomology, but I feel that if scientific entomology works hand in hand with chemistry and physiology, many surprises are in store for us. I feel that something will be done towards a simplification of the common formulæ now in general use.

Economic Entomology, then, as far as Ontario is concerned, dates from the early seventies, although considerable had been written earlier by Professor Hind and Dr. C. J. S. Bethune, the latter as editor of the entomological column of *The Canada Farmer* from 1865 to 1873. I am sure that Dr. Bethune himself will acknowledge that the information at that time regarding remedial treatment was not very extensive. It is true that our fathers and mothers at times practised according to the very latest methods, and that they had some knowledge of the value of the soaps and lye as insecticides. The series of Annual Reports issued by the Entomological Society beginning with 1870 were most admirable, and probably did more to familiarize the people with the names and habits of the common insects of the orchard and garden than any other cause. When one travels about the country, as I have sometimes occasion to do, on insect quest, one is often surprised at the amount of knowledge displayed by the older men. These men had read the early Reports, and had inwardly digested them.

When Dr. C. V. Riley was preparing his famous Missouri Reports, our entomologists furnished him much information and material, for their names are frequently mentioned by him. Among the workers at this time were : Dr. Wm. Saunders, of London ; Dr. Bethune, of Port Hope ; R. V. Rogers, of Kingston ; E. Baynes Reed, of London ; and B. Gott, of Arkona.

A little later, Dr. Fletcher and Mr. Harrington, of Ottawa, J. A. Moffat, J. D. Evans and Dr. Fyles joined the Society, and soon took a prominent part in its proceedings.

When the Experimental Farm was established at Ottawa, Dr. Fletcher was made Dominion Entomologist. His annual reports have always contained the very latest information as to the best remedial treatment for the noxious insects of the farm, garden and orchard. Through his labors, our knowledge of insect life has been greatly widened. His pen is facile and his tongue is both fluent and eloquent. For the last 15 years, Dr. Fletcher has been the chief entomological figure in Canada, and his reports are eagerly scanned by our brother workers across the line. Long may he be spared to occupy the important position he now holds !

Indirectly for many years, Professor Pantou was performing a very important work at the Ontario Agricultural College by training a younger generation of observers in the ways of insect life. His was a busy life among his students, and it is a great regret that he could not find more time to attend the annual meetings of this Society of which he was a member.

During the eighties and early nineties, the values of the chief insecticides were determined. With the adoption of better methods of farming and the rotation of crops, it was possible, in many cases, to control the attacks of injurious insects. The knowledge of insect life became more general through the efforts of men like Dr. Fletcher, Dr. Saunders, Dr. Bethune, the annual reports of both Dominion and Province and the many speakers attending the Farmers' Institutes, of which Prof. Pantou was chief entomological speaker.

Among the chief insect pests of the Province in late years were : the Hessian Fly, the Army Worm, the Wheat Midge, the Pea-Weevil, the Horn Fly, Cutworms, Wireworms, the Cabbage and Onion Maggots, the Codling Moth, the Clover-Seed Midge, the Tent Caterpillars, the Potato Beetle, Apple Aphis, the San Jose Scale and the Tussock Moth. For all of these remedies have been determined, so that the intelligent, wide-awake farmer and fruit grower need have no difficulty in controlling them. It would be difficult to estimate the money thus saved to the Province every year by the adoption of the remedies advocated by the entomologists, members of this Society.

While the main efforts of our members have been given to the perfection of remedial measures, which, I am proud to say, have been adopted by the best farmers and fruit-growers, I surmise that considerable attention will have to be given to the work of educating the rank and file, if the country is to get the full advantage of our work. I feel that we must enter upon an educational campaign. I do not imply that we must not remain investigators as in the

past, but we must take every opportunity to write and speak about our work. When we realize that fully ten per cent. of the produce of the farms are destroyed by insects, we have some idea of the importance of our mission. We need not only more investigators, but also more propagandists and expounders.

A great opportunity is open to us in furthering the new educational idea of Nature-Study. It is now fairly well recognized that insect life forms one of the best subjects for Nature-Study. Let us help along the good work, for by so doing we are hastening the time when all will know the facts which we have patiently determined. I am a firm believer in the doctrine that, whenever possible, those forms should be studied, which are of importance economically.

It is pleasing to learn that the Annual Reports of our Society are appreciated as fully on the other side of the line as they are at home. Listen to what the President of the Association of Economic Entomologists said in his Presidential Address read in Washington not one year ago. Dr. Felt said: "The reports of the Entomological Society of Ontario, beginning in 1870 and extending to date, are a remarkable series of publications, replete with interesting and valuable observations by many writers upon the economic insects of that section. These reports, and those from 1884 to date, of Dr. James Fletcher, entomologist and botanist of the Dominion Experimental Farms, include most of our records concerning the insects of the northern part of America, and are composed largely of original observations and exceedingly practical recommendations and deductions from observed facts." (Proceedings of the Fifteenth Annual meeting of the Association of Economic Entomologists, page 13).

The three epoch-making works on Economic Entomology in America have been Harris's "Insects Injurious to Vegetation"; Riley's "Missouri Reports"; and Saunders' "Insects Injurious to Fruits." Of these, Saunders' work is by far the best-thumbed book at the present time. Although first published in 1883 the observations recorded in that book are still remarkably accurate, and but slight revision would be necessary to bring the descriptions well up-to-date.

In any review of the work done in Entomology mention should be made of the most notable publications of the year. Two very valuable books have appeared, which should be found of great service to the systematic, and indirectly also to the economic entomologist. Early in the year Dr. Harrison G. Dyar, of the United States National Museum, distributed his "List of North American Lepidoptera and Key to the Literature of this Order of Ins. etc." It appears as Bulletin No. 52 of the U. S. National Museum. On account of the activity of many workers in Lepidoptera in recent years it had become almost impossible for the ordinary worker, away from the great museums and collections, to keep himself informed of the large number of new species which were being described in the various entomological publications. This Bulletin of Dr. Dyar's will be welcomed by hundreds of lepidopterists in the United States and Canada.

The other publication is "A Catalogue of the Coccidae of the World," compiled by Mrs. M. E. Fernald, the talented wife of Professor C. H. Fernald, of Amherst, Massachusetts. In these latter days when a knowledge of Scale insects is of such great importance to the economic entomologist this Catalogue comes as a "a long-felt want," and will be one of the most valuable books of reference on the shelves of the working entomologist. It will now be possible for the Coccidologist to complete his library with the necessary literature bearing on the scales with which he has to work.

I am sure that I voice the feelings of all our members when I say that we are all very grateful for the generosity of the Department of Agriculture at Washington, for its valuable publications, and we admire the activity of that Department along all lines of science related

to agriculture. We are indebted especially to the Division of Entomology, of which Dr. L. O. Howard is Chief, for generous and timely supplies of their most valuable Bulletins. Would that our Dominion could see its way clear to enlarge our working force !

It is the duty of the members of this Society not only to determine and announce the best remedies for the troubles produced by injurious insects, but also to denounce in strong terms the introduction of "fake" remedies, which occasionally come to our notice. Perhaps the most flagrant piece of imposition of the year was a "Process to protect Fruit Trees, etc., against Injury from Insect and Fungus Pests." This Process (according to the circular) consists in administering into the growing tree certain ingredients, in a particular manner, which the inventor has proved to be effective for the purpose above mentioned. It protects the trees and fruit against damage by borers, codling moths, caterpillars, San Jose Scale, black-knot, leaf-curl, yellows, scab, and other insect, parasite and fungus enemies to trees !

This is a wonderful remedy (according to the discoverer), but I regret to state that in those orchards where I have seen it tried the results have been far from satisfactory. The codling worm was there ; the borers were there ; the San Jose Scale was there ; everything in fact except favorable results. A great many fruit-growers appeared willing to give the "Process" a trial at a cost of 25 cents for every tree "plugged." The ingredients put into the hole in the tree were it is believed, charcoal and sulphur, both insoluble in water, and in the sap of the tree. Our knowledge of the movement of fluids within a tree is not sufficiently accurate to be able to state definitely what becomes of the various solutions which enter by the root, but we do know that charcoal and sulphur placed in a hole in the trunk of a tree will not affect the insect and fungus pests. One sometimes forgets that the circulatory system of plants is of the diffuse character, unlike that of the higher animals which have a definite enclosed system of tubes. We sometimes talk of the *upward* current and the *downward* current as if they flowed in well-defined channels, but the idea is not strictly correct. We should liken the currents of sap rather to a great river in times of flood, when its waters are flowing irregularly over the banks, and at the same time flowing strongly in the main channel.

Again, it is more than probable that any poison introduced into the plant would kill the cells into which it entered, and therefore kill the plant. It is very doubtful also if the cells of an active living plant would absorb substances in solution which would prove hurtful. Protoplasm has the power of regulating the entrance of substances which pass through it into the vacuoles of the cell. So long, however, as any part of the plant is a mystery, so long will so-called discoverers inflict their *nostrums* upon the unsuspecting public. To think also that this process emanated from the Mecca of entomology, London !

THE TRANSMISSION OF YELLOW FEVER BY MOSQUITOES.

By DR. L. O. HOWARD, UNITED STATES ENTOMOLOGIST.

The following is an abstract of Dr. Howard's able and most interesting address which was listened to by those present with the utmost attention.

The speaker began by mentioning some of the severe outbreaks of Yellow Fever which are especially memorable. Throughout the West Indies they have been frequent virtually since the discovery of America. In the United States there were outbreaks as far north as Boston in 1692 ; a century later there was a terrible epidemic in Philadelphia ; in 1853, 1878, and 1889 the disease raged in several of the Southern States and carried off thousands of victims. In consequence of this liability to outbreaks of the fever, these States were greatly hindered in their development and much injury was thus indirectly done to their interests and progress. Any remedy therefore which could be effectively prescribed for this plague was of immense importance to that whole region of country as well as to all the islands of the West Indies and some parts of the Spanish Main.

It was a source of great gratification and thankfulness that the remedy had at last been found, and that there need be no further fear of an epidemic of Yellow Fever in the future. It had been proved beyond doubt that this fell disease was only transmitted by a mosquito, and that by warding off the attacks of the insect it could be kept under complete control. There is now no further need of costly and vexatious quarantine arrangements; cargoes of perishable fruits from suspected ports will no longer be detained while the fruit is rotting, and commerce in those southern seas will be freed from the restrictions formerly imposed upon it.

Dr. Howard then related the various onward steps which had been taken in order that the important discovery might be verified and all doubts as to its truth be removed. For a long time it was supposed that the fever was either carried by the air or conveyed in clothing or other articles which had come in contact with one suffering from the disease. When at length science had discovered that micro-organisms were the cause of many infectious diseases, the search for the yellow fever bacillus was soon undertaken and many investigators laid claim to its discovery. Dr. Sanarelli, in 1897, published an account of a germ that he named *Bacillus icteroides* and which he believed to be the true cause of the fever. As this was subsequently reported to have been discovered by two surgeons of the U.S. Marine Hospital Service in thirteen out of fourteen cases of yellow fever in Havana, it was then by some accepted as the obnoxious bacillus.

The next stage in the investigation was the mode of transmission of the noxious organism from the sick to the well which caused the wide and rapid spread of the disease. Dr. Carlos Finlay, of Havana, was the first to put forth the theory that a mosquito was the agent, and in 1881, he stated his belief that this insect was the species known as *Culex* (now *Stegomyia*) *fasciata*. He failed, however, to prove the absolute correctness of his theory as the experiments he made were not entirely under his control and there was in consequence great room for doubt. It was not until so recent a date as the year 1900 that a full and convincing demonstration was made of the truth of this theory. An official board of United States Army surgeons under the leadership of Dr. Walter Reed, of the United States Army, was appointed to investigate the infectious diseases prevailing in Cuba, and they arrived at Quemado on June 25th, 1900. One of their first proceedings was to make experiments with Dr. Finlay's mosquito. Eleven persons allowed themselves to be bitten by contaminated mosquitoes. In two cases only did yellow fever result; one of these was Dr. Lazar, a member of the board, who died in consequence and thus laid down his life as a noble martyr to the cause of scientific work for the benefit of suffering humanity.

In the November following the board resumed its work and built two experiment houses a mile from the town of Quemado. In one of these, volunteers allowed themselves to be bitten by infected mosquitoes, and in the other volunteers, quite as brave, submitted to live and sleep in badly ventilated rooms with soiled bedding and clothing brought directly from yellow fever patients in the hospitals. Both cottages were screened to prevent the ingress of any mosquitoes from outside. The result of the experiments was that out of thirteen of those bitten by infected mosquitoes, ten contracted the disease, while the volunteers who spent many nights in contact with infected clothing entirely escaped. The utmost care was taken to preclude any possibility of mistake, and the results have been accepted by medical investigators who visited the station as absolutely conclusive.

Dr. Howard paid a high tribute to these men who so bravely risked the loss of their lives by a loathsome disease without any prospect of pecuniary reward, in order that by doing so they might help to save thousands of their fellow-creatures in the future from disease and death. Courage such as this, exhibited by American soldiers and hospital attendants, should rank as high in the annals of heroism as the bravest deeds done on the battle-field or in stress of storm or fight at sea.

After having established the fact of the transmission of the disease through the agency of mosquitoes, further investigations were carried on by the members of the commission in order to discover if possible, the micro-organism which caused it. Repeated experiments revealed that the disease could be conveyed not only by the bite of the mosquito but also by the injection of the blood serum of a yellow-fever patient into the system of one who was not previously immune to the infection. And this blood serum it was found could actually be filtered through porcelain and yet still retain its power to convey the disease. On being submitted to various degrees of heat, it was discovered that the serum lost its toxicity at a comparatively low temperature, one too low to have effect upon any known toxin. It seems, therefore, to be conclusively established that the cause of yellow-fever is a micro-organism in the blood which it is beyond the power of the microscope to detect.

These experiments satisfactory as they were, did not entirely convince the physicians of the south, and accordingly other and independent investigations were made. In 1901 the Havana Board of Health caused a series of experiments to be carried on at Las Animas Hospital under Dr. Guiteras, a well known yellow-fever expert, and Dr. J. W. Ross the director of the hospital. In a number of cases the disease was conveyed by the bites of infected mosquitoes and several of the patients unhappily lost their lives, while those who submitted to contact with infected clothing and at the same time were protected from mosquito bites, came out of the ordeal in good health and perfectly free from the disease. These experiments were conducted with the utmost care in order to preclude any doubt as to the certainty of their results. They entirely corroborated the conclusions drawn by Dr. Reed from his investigations of the previous year.

Later on further experiments of a most careful kind were conducted at Sao Paulo, Brazil, by Dr. Lutz, director of the Bacteriological Institution of that province. In this case mosquitoes were brought from uninfected places at a distance, allowed to bite a yellow fever patient, and then conveyed to another uninfected region some hundreds of miles away; there they were allowed to bite non-immunes who had been for some time quarantined and who voluntarily submitted to be experimented upon. Out of six cases three contracted the disease, and all happily recovered. The effect on public opinion of this experiment was very great, and all opposition to the adoption of practical measures for the extermination of mosquitoes was soon abandoned.

If further proof of the reality and importance of this discovery were needed, it may be found in the fact that now the City of Havana is free, and has been so for many months, from the plague of yellow fever—for the first time probably in its history. That this immunity is not due to other causes is evident from the fact that although the city was thoroughly cleansed and effective sanitary measures were put in operation during the American administration and under the Cuban Board of Health, yellow fever still prevailed while the general health in other respects was vastly improved. When, however, the extermination of mosquitoes was undertaken, their breeding places destroyed, and all yellow fever patients protected from the bites of these insects, the dissemination of the disease was at once checked and no fresh cases occurred. This was indeed a great scientific triumph—one that has brought immense blessings in its train, and which has opened the way to future achievements for the benefit of mankind in various regions of medical investigation.

Dr Howard gave a description of the mosquito, *Stegomyia fasciata*, and stated that it was in the habit of biting in the day time as well as at night; that it was essentially a house insect, breeding in water tanks and barrels, in the roof troughs, and anywhere where standing water was to be found; it was not usually met with in the woods, but was very abundant in cities and towns. Its thorax, abdomen and legs are banded with white, and hence it is named *fasciata*, the striped mosquito, (Fig. 2); the larva resembles that of other mosquitoes, and being

a true air-breather is easily destroyed by a film of kerosene oil on the surface of the water that it inhabits ; the eggs (Fig. 3) are laid singly in standing water. This species is tropical or

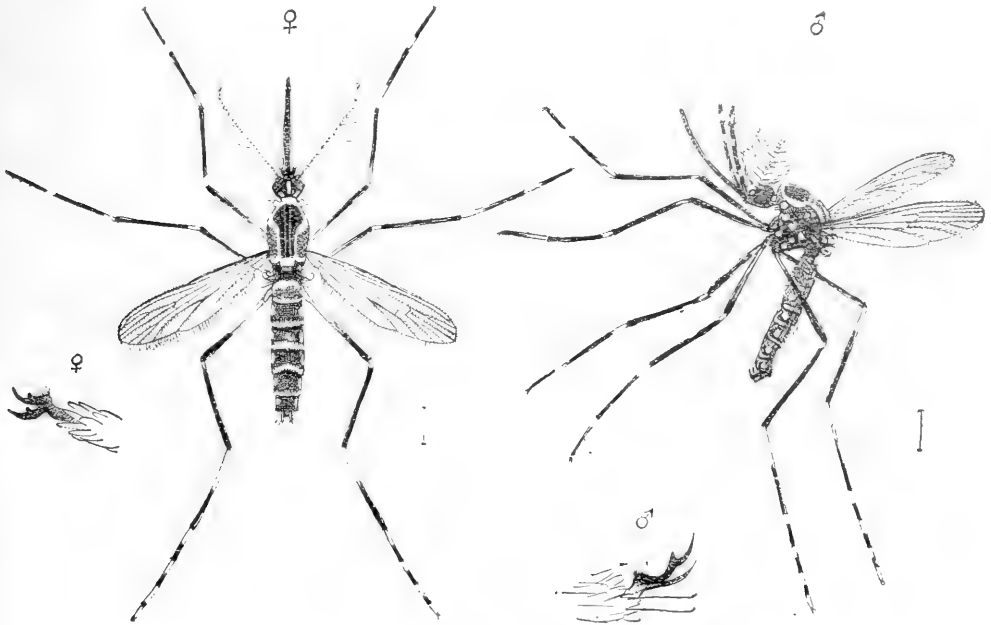


Fig. 2. The Yellow-fever Mosquito. (*Culex* [*Stegomyia fasciata*] *veniatu*s or *fasciatus*.)^{*}



Fig. 3. Eggs of Yellow-fever Mosquito in natural position on Grass-stems.^{*}

subtropical in its range, being only found between the latitudes of 38° north and south and at low altitudes ; throughout this region it is necessary that any person affected with the fever should be absolutely protected from the mosquitoes, as by this means the spread of the disease will be prevented. No other form of quarantine is necessary ; no one is liable to contract the disease unless he is bitten by a mosquito which has previously bitten a yellow fever patient.

^{*} These illustrations are given by kind permission of The Century Co., New York.

This discovery Dr. Howard regards as one of the greatest in these opening years of the 20th century, and he thinks that we are on the eve of a great revolution in medical science which will result in the prolongation of the lives of future generations when the true causes of fatal diseases have become known.

A series of questions on various points were then asked, to which Dr. Howard very kindly and fully replied. A hearty vote of thanks was moved and seconded and very cordially adopted by the audience.

SECOND DAY'S SESSION.

FRIDAY, SEPTEMBER 4th, 1903.

The Entomological Society resumed its meetings at 9 30 o'clock, a.m., the President, Prof. Lochhead, occupying the chair. His own paper on "Insects of the Year," was the first upon the list; he was followed by Dr. Fletcher, who spoke on the "Insects of the Season in Ontario," and by Dr. Howard who gave an address on "Recent Work in American Entomology." These papers were listened to with great interest and were followed by animated discussions in which most of those present took part. Dr. Fletcher and Mr. Gibson exhibited many specimens in illustration of the insects which had been specially injurious in Ontario.

In the afternoon the Society met at 2.30 o'clock and at once proceeded to the election of officers for the ensuing year, which resulted as shewn on page 4. Papers were then read by Mr. Gibson, Mr. Lyman, Mr. Stevenson, Dr. Fletcher, Mr. Winn and Dr. Bethune, and were in many cases fully discussed. The majority of these papers are published in the following pages, but a few, being of a technical character, will appear in the "Canadian Entomologist," the monthly organ of the Society; among the latter may be mentioned papers by Mr. Lyman on "Two remarkable aberrations (Lepidoptera)," by Dr. Fletcher on "Life-histories of *Apochima Rachelae* and *Leucobrephe Middendorfii*," and by Mr. Gibson on "The larvae of Canadian Tiger Moths of the genus *Apantesis*."

Votes of thanks were heartily passed to the Ottawa Board of Trade for the use of their room during the meetings; to the Principal of the Normal School for the use of the Assembly Hall on Thursday evening; to the newspaper press of the City of Ottawa for their notices and reports of the proceedings.

Mr. Williams, on behalf of the Toronto Branch, invited the Society to hold its annual meeting in 1905 in Toronto, and assured the members that they would receive a hearty welcome. He urged also that it would help and encourage the Branch very much and be of great benefit to it and to the Society at large. After some discussion of the matter, Mr. Williams was thanked very much for the invitation and it was decided to defer action until next year.

A cordial vote of thanks was given to Dr. Howard "for his kindness in attending the meeting, and for his valuable addresses which contributed so much to the success and interest of the meeting."

On Saturday morning a visit was made to the Division of Entomology at the Central Experimental Farm, where some time was spent in examining the collections under the guidance of Dr. Fletcher and his assistants, Messrs. Guignard and Gibson. At 12 o'clock the visitors were driven about the Farm and shewn the chief objects of interest and at one o'clock were entertained by Miss Dorothy Fletcher to an *al fresco* lunch in the Botanical Garden. The afternoon was spent, with nets and collecting apparatus, in an excursion to Dow's Swamp and the Rideau River; the weather was not very favourable for securing specimens but the outing was nevertheless much enjoyed, and the kindness and hospitality of Dr. Fletcher and his daughter were highly appreciated by all who had the good fortune to be there.

The following exhibits were shown by those attending the meeting :

By Dr. James Fletcher : *Apocheima Rachelae* in all stages from the egg to the perfect insect, with inflated larvae; *Leucobrepheos Middendorffii*, in all stages; *Chionobas Alberta* without any ocelli above or below; *Gynaephora Rossii*, bred by Mr. Percy B. Gregson, from larvae found at Blackfalds Alta., also mature larvae collected this year at the same place. The type specimen of *Catocala unijuga*, var. *Fletcheri*, Beutenmueller.

By Mr. Arthur Gibson : A complete collection of the Arctic moths of the genus *Apantesis* so far recorded from Canada, and referred to in his recent paper. Also a collection of about fifty inflated larvae of lepidoptera.

By Dr. Bethune : The remarkable beetle found by Mrs. Slosson in New York (Can. Ent. XXXV, page 183, July 1903) which has not yet been identified.

By Dr. C. H. Young : A fine collection of inflated larvae taken during the season, or reared from the egg—all local (Ottawa) species. About fifty noctuidae taken at Ottawa many of them not previously recorded from that district. Also a fine female specimen of *Erebis odora* taken at sugar.

By Mr. Lyman : The remarkable aberrant forms of two moths, referred to in his paper.

By Mr. J. D. Evans : A box of moths taken at Trenton including among other rarities *Apatelodes angelica*.

By Mr. A. E. Norris, Montreal : Box of moths including *Cossus centerensis*, *Hydracia rutula*, *stramentosa*, *marginidens*, *purpurifascia*, *cerussata*, and *Cressonia juglandis*.

Specimens were also exhibited by Mr. Stevenson and Mr. A. F. Winn, of Montreal, and Mr. J. B. Williams, of Toronto. In addition to these there was exhibited a specimen of a Blue Lizard, the only species taken in Canada.

INSECTS OF THE SEASON.

By W. LOCHHEAD, PROFESSOR OF BIOLOGY, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

From my own observations and from reports obtained from most sections of the Province, it is evident that the injuries done by insects this year have been below normal. The causes which lead to the decrease or increase in the number of injurious insects for any particular season are not well determined. We still require to make many observations and to make more thorough search into insect life at all stages of the year before much head-way can be made in determining the causes. We must note, however, that the seasons of 1902 and 1903 were both cold and wet, and when we bear in mind that this combination of conditions is very harmful to larval life it is probable that some of the causes for the dearth of insect life during these seasons have been determined. As in my previous reports I shall deal with the injurious insects according to their host plant.

CEREAL CROPS.

Hessian Fly. Cereal crops have not been disturbed much by insect life. The Hessian Fly scourge which did so much damage in 1900 was not evident, and in most localities was almost entirely absent. This happy condition of things is due to the action of the farmers themselves in accepting the advice of the entomologists who had studied this question quite thoroughly. The farmers had got into the habit of planting their fall wheat too early. In some of the central counties in the south-western part wheat was sown as early as the 20th of August. Experience soon convinced them that the entomologists were right, and that they were working in league with the Hessian Fly by planting their wheat at that date. Late planting is now the rule in most sections, and from all reports the crops are just as heavy as if they had been sown two or three weeks earlier.

Wheat Midge. In early spring there was a fear lest the Wheat Stem maggot would become destructive this season, for many fields showed evidence of being badly infested. Through some cause or other the pest did not make headway, and it is probable that very little damage was done.

PEA CROPS.

Pea-Weevil. Judging from the returns of the Bureau of Industries the farmers of the Province took the timely warning and are giving up to some extent at least the growing of peas, and substituting other crops, in some cases Grass Peas, in others Emmer, and so on. This was the advice given in the bulletin issued by the Department of Agriculture, Toronto, early in the year. It was felt that although fumigation with carbon bisulphide was a good remedy, but few of the farmers would take the trouble to fumigate their peas immediately after harvest. In some sections the growing of peas has been discontinued entirely, and it will not be long before their growing can be resumed. In the newer sections where pea growing is still a profitable industry the fumigation treatment is highly recommended, but in the older sections where the crop has been a failure for the past few years it is as strongly recommended that the growing of peas be given up entirely for two years at least. This summer I had an opportunity to make a few observations regarding the deposition of the eggs of the pea weevil. They are, as you probably know, spindle-shaped and of a golden color, and are deposited on the outside of the pod. It is the general impression that the eggs are deposited in the pods while the pods are very small, in fact when the blossoms are still to be found. I found this season fresh eggs deposited on pods two and three inches long, and the peas within afterwards became thoroughly weevily. It is my strong impression that the beetle continues to lay eggs for a longer period than is suspected, and that is the reason why the late crops suffer almost as much as the early crops.

ROOT CROPS.

Beet Leaf Miner. Up to date of writing the root crops have been singularly free from injurious insects. The introduction of large areas of sugar beets has brought into prominence the pest which may give considerable trouble in future years. This is the Beet Leaf Miner (*Pegomya vicina*). About the 20th June the sugar beets in many sections were badly infested with this leaf-miner and the indication at that time pointed to considerable loss of the beet crop. Strangely, however, the damage did not prove to be very serious, and but little complaint was heard in later months. The adult of these leaf-miners is a two winged fly. This pest is not a new one for we have been made acquainted with its habits through the writings of the entomologists of the United States. According to their observations the eggs are placed on the under side of the leaf, usually singly, and the maggot enters the leaf immediately on hatching. There may be many broods during the season. When the maggot becomes full grown it leaves the leaf and changes to pupa either on the leaf or in the surface of the ground. It is probable that it hibernates as pupae from which the flies emerge in April or May. It has been observed that it is preyed upon by a bug which often keeps it in check. In spite of all that has been done no successful attempt has been made to destroy the pest. The following methods have suggested themselves and have been tried with but partial success; first, deep plowing, and rolling the infested fields in the fall to bury the pupa deep so that the flies cannot emerge; and weeds of the species of Lamb's Quarters should be destroyed in as much as the insect also feeds on this plant. Where these weeds are abundant the pest is also likely to spread to the beets.

ORCHARD INSECTS.

Codling Moth. Recent observations lead me to think that the Codling worm was quite destructive this summer. The effects of the first brood were not very evident, but those of the second are becoming quite in evidence. As in previous years there is no better method of dealing with this pest than to spray thoroughly with Bordeaux Mixture and Paris Green and to bandage the trees with burlap before the second week in June and to examine the bandages every two weeks during July and August for cocoons of Codling Moth.

Plum Curculio. The plum curculio although abundant this year has not been felt much on account of the tremendous supply of plums through the country. It simply thinned out the crop and did very little damage. There has always been considerable discussion as to the best method of dealing with the plums in ordinary seasons. Some orchard men prefer jarring the trees, while others place considerable faith in an application of Paris Green. There seems to be some reason for the belief that there is a time in the history of the curculio when it is more readily killed than at other times. One observer reported to me that he always had good results in spraying curculio with Paris Green before the incision had healed. He believed that if he could apply Paris Green in the incision before it healed over, that the young grub would get a poisonous meal when hatched.

A Cherry Fruit Fly. W. E. Gammage, Oshawa, reports the loss of all his fruit from some English Morello cherries. The cherries began some time ago to rot, and when I examined specimens of the injured fruit I found a maggot within each. These maggots I believe to be the cherry fruit-fly which was quite destructive a year or so ago in New York State. I received some of the infested cherries from Mr. Gammage on Aug. 21st and found them infested with the maggot. Prof. Slingerland in BULLETIN 172, Cornell Agricultural Experiment Station says, "We have found young maggots as late as August 16th." The maggots which I found in these Morello cherries were light yellowish white in color, and near the head were two slight projections. These peculiarities corresponded with the description given of this pest by Prof. Slingerland. According to him the maggots hatch from eggs laid by a pretty little fly as small as the common house fly. Their wings are crossed by four blackish bands, and have also in addition a blackish tip. The maggot confines itself to a single cherry and lives within it during its whole life which may last three or more weeks. Many of the maggots would be full grown when the fruit would be ripe. They change to pupæ on the ground or at the bottom of baskets and rubbish. There seems to be but one brood per season and most of this is passed as pupa. In England where the pest is better known remedial treatment has not been entirely successful. Spraying seems to be out of the question for before it can pass beneath the skin the maggot is within the fruit, and the pupa is within the ground. Undoubtedly much can be done to check this pest if the infested fruit were picked up and burned before the maggots turned into pupæ, but this is hardly practicable, unless the whole crop were picked and burned before the maggots became mature. Cultivation has been tried in Australia in the hope that the pupæ might suffer by the process of cultivation, but their results were not satisfactory. Much can be done to keep this in subjection by allowing hens free access to the cherry orchard, especially if the ground were stirred up occasionally so that the pupa might be more readily exposed to the poultry.

Pear Tree Psylla. This insect has been very injurious this past season, more especially in the Grimsby district. A correspondent writes this regarding it: "When I came home on

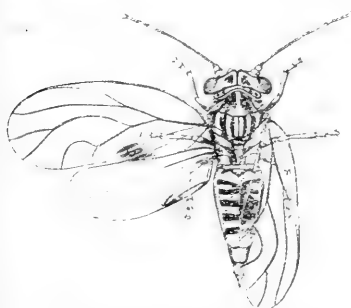


Fig. 4. Pear-tree Psylla; adult winged female, greatly enlarged.
(After U.S. Dept. of Agriculture)

July 4th, many trees were fairly covered with it. The insects were mostly wingless forms with a few winged forms. (Figs. 4 and 5.) They are found in the axis of the leaves, along the petiole and along the blade, but chiefly found on the leaves a short distance from the vein or just in the axis of the secondary veins or mid-vein. In the first place, the tissue of the leaves dries up in spots where they are situated, but in the latter case they cause a drying of the tissue along the edge of leaf. When the Psylla is situated in the outer axis of the leaf, the petiole seems yellowish in color and the attachment to the stem seems weak. About

July 15 to 25, the Psylla were most abundant—the number of winged forms increasing until the 25th. A heavy rain on the 23rd cleared the trees of the sap and seemingly quite a number of the Psylla. After another heavy rain on the night of July 27th, I noticed that there were very few of the wingless forms but a great number of the winged ones. Up to this time very few leaves had fallen off, although the growth of the trees was completely stopped, in fact, our trees have apparently made no growth at all this year excepting a few that were free from the Psylla. Where there was growth, it was from two to four feet. At the time of writing, August 27th, the wingless forms have again become numerous and the winged ones few." (W. R. Dewar.)

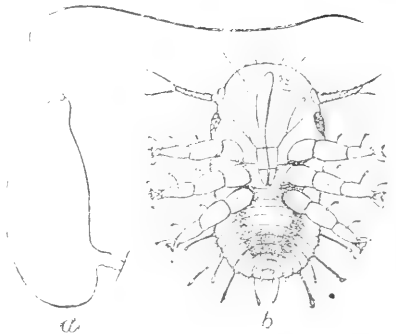


Fig. 5. Pear-tree Psylla : a egg; b larva; greatly magnified (from U.S. Dept. of Agriculture).

THE CLOVER CROP.

The clover seed industry of Ontario is of no small importance. A buyer for one of the large seed houses told me recently that the average total value of the clover seed produced in Ontario for one year was two million dollars. The loss done by insects was fully one-half of a million, or, on the average, one-fourth of the crop. In the large sections where the growing of clover seed has up to the present been quite lucrative, it is almost a complete failure this year. In the south-west counties especially, the work of the Clover Seed Midge has been very destructive. Many good reliable farmers who have been in the habit of feeding off their clover until about the 10th of June have found their second crop of clover badly infested, and they have come to the conclusion that very frequently the eggs are not deposited before the 10th of June. They have frequently observed also that when the first crop of clover was left uncut until about the 20th of June that they secured a good crop of seed from the second crop. It is advisable, therefore, to postpone cutting the first crop of clover until after the 20th of June. The history of the Clover Seed Midge has been frequently described. It is a minute two-winged fly or gnat which lays its eggs in the flower heads of the clover in May or in early June and again in July. There are two broods in a season. The larvæ of the first brood reach full growth about the end of June, when they descend to the ground and change into pupæ, the adults emerging a couple of weeks later. Eggs are again laid in July and from these emerge the second brood of larvæ which injure the fall crop of clover seed.

It is quite probable that the Clover Seed Midge is not the author of all the mischief. I found frequently in clover heads in June a species of Thrips which eats the newly formed seed.

INSECT PESTS OF SHADE TREES.

Tussock Moth. The pests of shade trees have been more abundant than usual. In Toronto and the surrounding towns the Tussock Moth has been very destructive. Woodstock and the western towns have suffered severely from the Cottony Maple Scale. While the Spruce Gall-Louse is gradually making its way into nearly all the spruce hedges in the Province.

The life history of the Tussock Moth is well known, and the remedies which have been suggested are quite effective. It lies altogether with the city authorities to stamp out the pest. The most effective methods are the following: First, collect and destroy the masses of eggs which are to be found during the winter on dead leaves, rubbish, and on fences. A very effective way of gathering these would be to offer the children a bonus for every egg cluster collected. Second, to bandage the trees with some sticky substance so that the female, which

is wingless, may be prevented from climbing up and depositing her egg masses on the tree. Mr. C. W. Nash, of Toronto, has very pertinently said that in the orchard and shade trees every egg mass can be taken off without much difficulty, but "I am sorry to say that the woods for miles around Toronto are now badly infested, and from these strongholds there will be some difficulty in destroying them." He very properly blames the civic authorities for their negligence in fighting the pest at wrong times and with improper weapons.

Cottony Maple Scale. For some years this pest has not been destructive, but this season it seems to have gathered force, and is proving quite serious in some sections. Alarming reports come from Woodstock and London, and Waterloo is becoming anxious as to the effect this pest will have upon the maples.

This pest is quite conspicuous in early June on infested trees with its cottony secretion. This waxy substance is secreted by the female at the time the eggs are being deposited, and forms a protective covering for the eggs. At one end will be noticed the oval, brown scale, the remnant of the mother insect, for this insect belongs to the family of scale insects (Coccidae), to which also belongs the terrible San José scale, about which much has been said, done, and written during the last few years.

The eggs laid by a single scale are very numerous, and begin to hatch about the end of June or beginning of July. At this time swarms of minute lice may be seen crawling on the infested twigs. They soon fix themselves to the bark by inserting their beaks, and begin to suck the sap of the trees. In a short time the young begin to form scales of their own by secreting a waxy substance through certain pores on their body. In September they become adult. The males die before winter, but the females migrate from the leaves to the twigs, where they remain all winter. In spring the females grow rapidly, and the eggs are laid as described in the cottony sack in June.

With regard to remedies, it may be said that whenever a few of the cottony sacs appear the best plan is to cut off and burn the infested twigs, for by doing so thousands of eggs will be destroyed.

However, when, by reason of numbers, this operation becomes impracticable, resort must be had to spraying solutions. Kerosene emulsion and whale oil soap solutions are perhaps the most effective. The standard kerosene emulsion should be diluted with ten parts of water if used alone. Some authorities recommend the use of the mixture—the standard emulsion is diluted with one pound of fish oil dissolved in ten gallons of water.

The best time to apply the mixture is about the first or second week in July, when the young lice emerge from the eggs. They are then easily killed. Winter or fall treatment is also valuable. The same substance may be used, but the solutions should be stronger than those used in summer.

In some cities where the cottony scale made its appearance good results were secured by applying a strong stream of water against the cottony sacs when they contained the eggs, and before these hatched. By reason of the abundance of parasites this pest is seldom troublesome more than two seasons.

GARDEN INSECTS.

A Gooseberry Fruit-Worm. For several years the fruit of the thinnest skinned American varieties of gooseberries have been destroyed by a worm which is the caterpillar of a moth. (Fig. 6). Early in July I received some specimens of gooseberries which were well formed but which had dropped from the bushes. The fruit at this particular time gave no indication that they were infested beyond that they had dropped prematurely and had ripened also prematurely. In a few days, however, the fruit became softened at the heart and the presence of the caterpillar became evident. It had eaten away some of the pulpy tissue near the heart and the fruit had collapsed and decay had set in.



Fig. 6. Gooseberry Fruit-Moth.
(*Dakruma Convolutella*) and
pupa

I have been unable to breed an adult from the caterpillar. I am of the opinion that it winters over as a pupa. The caterpillar is between one-third and one-half of an inch in length, is white with a slight tinge of green, tapers slightly between both ends, its head and cervical shields are dark brown, each segment of the body has eight little elevations and from the centre of each rises a hair. Mr. Spillett, of Nantyr, has lost nearly his entire crop. It is probable that the only way of dealing with this pest is to spray the young fruit thoroughly with Paris green just after blossoming. Mr. Spillet describes the work as follows: "For the past two years I have had strong suspicions that this falling, which has now become serious, was caused by the presence of a maggot in the berry, as every berry after lying on the ground for a few days had a dark spot appear on the surface of the skin which gradually enlarges until the whole pulp becomes red but not ripe. Again the thick skinned varieties are never affected."

Asparagus beetles. The Asparagus beetle is still marching westward through the peninsula of Ontario. Last year there were but few of them in evidence at Guelph, but this year the 12-spotted species were quite abundant. None of the steel-blue forms (*Crioceris asparagi*) were seen.

At St. Catharines where the asparagus beetles are very numerous, considerable trouble is experienced in preventing damage to the crop. One grower says that he has trained his hens to feed in the asparagus rows, and he is no longer troubled with the pests. Another reports using McBain's carbolic wash (1 to 45) with excellent results.

Other garden Insects. The Squash-bug and Cucumber beetles were not serious pests this season, and not much damage was done so far as I could learn. It is difficult to account for the diminution.

In Essex many complaints were received as to the ravages of the Tobacco Sphinx caterpillar. Few of the growers appeared to see any connection between the caterpillar, the jug-handled pupa, and the large sphinx moth which is often mistaken for a bat. In ordinary years hand-picking the caterpillars is sufficient to keep them in check. In tobacco sections greater attention should be given to the destruction of the pupae, for they are readily seen when the ground is plowed.

Cabbage-root maggots were abundant early in the season, but when prompt attention was given to the young crop no serious harm was done. The maggots were readily detected, the infested plants removed, and new plants substituted. Most cabbage-growers prefer to replant rather than use the Goff tar-paper collar.

NOTES ON THE SEASON 1903. (WESTERN QUEBEC.)

BY CHARLES STEVENSON, MONTREAL.

The collecting season was similar to that of 1902. It was very promising during the first months but the low temperature during the latter part of June and St. Swithin's rains throughout the last half of July and the first half of August made insect-hunting out of the question. The latter half of August was good and the results of the net showed that the emergence of many forms of insects had been kept back.

The attractive captures during the season in Coleoptera, were ;—

Hadrobregmus foreatus, Kirby, Montreal, 22nd March.

Eustrophus bifasciatus, Say. Cote des Neiges, 10th April.

Dorcaschema nigrum, Say. Montreal, 14th May.

Brachylobus lithophilus, Chd. Laval Co., 7th June.

Loricera caerulea, Linn. Laval Co., 7th June.

Callidium aerum, Newm. Montreal, 23rd June.

Arhopalus fulminans, Fab. Montreal (on oak logs) 23rd June.

Obrivum rubrum, Newm. Cote St. Paul (by Mrs. Stevenson while sweeping among long grass) 28th June.

Leptura nigrella, Say. Cote St. Paul, 28th June.

Cychrus viduus, Dej. was again taken at St. Hilaire, 25th May, by Mr. G. Chagnon.

In Lepidoptera :—

Sthenopsis thule, Strecker, 10 specimens were taken by Mrs. Stevenson, between the 6th and the 15th of July at Montreal South, Chambly Co. They were abundant on the first mentioned date, the evening of which was warm and very close. One specimen was caught flying along a street in the village. On the following evenings which were damp with strong cold winds they were scarce and only appeared when the trees or bushes were disturbed by beating.

Pieris napi, Esper, aberrant form *virginensis*, Edwards, was very plentiful at Cote St. Paul between the 3rd and 10th May.

Melitæa phæton, Drury, was abundant around St. Hilaire, 24th and 25th May.

Sugaring for moths was not a great success. At Montreal West, several specimens of *Gortyna nictitans* Bork. were taken at this bait by Messrs. Chagnon, Norris and myself and one specimen of *stramentosa* Guenée by myself on 24th August.

Collecting at light was fairly good and during August was very encouraging, and many specimens new to the collections of the members of the Montreal Branch were taken. One interesting capture in Coleoptera made by myself while climbing an electric light pole on the 28th of August, was a long horn beetle *Xylotrechus sagittatus*, Germ. and it is probably a new record for this locality (Montreal) as the only specimen I know of in Montreal Collections, is one in Mr. G. Chagnon's, from the States, which is a dark brown specimen and my capture is a black variety. The numbers of the Plum Curculio, *Conotrachelus nenuphar* Hbst., attracted to light were surprising.

Many insects injurious to vegetation usually so common have been scarce, but the Tussock Moth caterpillar continues to increase and the trees are thickly covered with their cocoons. The potato beetle *Doryphora decemlineata* Say, was not so generally distributed as in former years although large colonies were to be found in widely separated districts.

The common sulphur, *Colias philodice*, Golt. has been scarce and *Danaus archippus*, Linn. was a rare butterfly.

In last year's "Notes" mention was made of a syrphid fly new to Montreal Collectors which I caught at Piedmont. It has been identified by Mr. G. Chagnon as *Criorhina armillata*, O.S. ♀ a species described by Osten Sacken in 1878 from one ♀ specimen taken at Quebec and as Mr. Chagnon cannot find any other record of its capture in Canada or the States it may be a rare insect of Northern distribution.

NOTES ON THE SEASON OF 1903.

By A. H. KILMAN, RIDGEWAY, ONT.

My time having been fully occupied I have not given much attention to insects, but I have observed that many common species have been unusually scarce. Doubtless, the frequent rains destroyed many insects. Possibly, the vigorous growth of foliage due to the rains conceals the ravages of leaf-eating insects; at all events, much less than the average amount of injury appears to have been done in this locality.

The plum crop is exceeding abundant, evincing the scarcity of the plum curculio. The cabbage butterfly is, thus far, conspicuously rare. Sugaring for Catocalas in August failed not only to produce those of the "hidden beauty" but also in attracting other noctuids usually so abundant around the bait as *Apatela*, *Agrotis*, *Hadena*, etc.

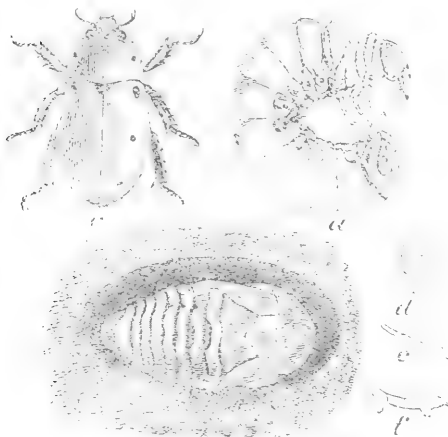


Fig. 7. *Pelidnota punctata*: a the grub, b pupa, c beetle (clay-yellow with black spots).

It may, however, be of interest to mention three observations which I have made of insects not heretofore appearing in injurious numbers in this immediate vicinity.

A grape grower complained that an insect was eating holes in the leaves of his vines. He said it was a beetle of good size. I asked him to bring me specimens, thinking it would prove to be the grape-vine flea beetle. (*Graptodera chalybea*.) You can imagine my astonishment when he brought a box full of *Pelidnota punctata*, assuring me that I could have more if I wished, and said they were flying among the vines "thick as bees." This beetle is to be found here any year, but it has never before, to my knowledge, appeared in greater numbers than one or two to the vine. (Fig. 7.)

The Rose-beetle has been unusually abundant and destructive this season. I have always thought that a light sandy soil was necessary for the propagation of this insect, and for that reason we might not be much troubled with it, but this year it thrives, even in the rocky soil of Ridgeway.

My third observation relates to *Crioceris asparagi*, Linn. In my collection, the specimens are labelled from Utah and New Mexico supplied by exchange, but I think we need not import any more, dead or alive. The asparagus beds in our gardens produced enough for all the collections in the Empire this year.

Doubtless, its presence has been observed in many places in Ontario ere this, but 1903 marks its advent to this particular part.

It threatens to be a real pest to the market gardener, and if the Society has not already published the best means of suppressing its ravages, it will be well to do so now.

RECENT WORK IN AMERICAN ECONOMIC ENTOMOLGY.

BY DR. L. O. HOWARD, UNITED STATES ENTOMOLOGIST.

Dr. Howard prefaced his remarks by giving a brief account of the Division of Entomology in the Department of Agriculture at Washington. He stated that he had now a staff of no less than thirty-seven assistants, many of whom were engaged in field investigations at various distant points, and a grant from the Government of \$70,000 a year. He contrasted his position with that of the Dominion Entomologist, Dr. Fletcher, who was expected to cover the enormous territory of Canada, stretching from the Atlantic to the Pacific, with only two assistants, who were employed in the office at Ottawa, and a very limited pecuniary support. He thought that the attention of the authorities should be drawn to this unsatisfactory condition and that Dr. Fletcher's hands should be strengthened and his work rendered more useful and available by a large increase in his staff and a commensurate expenditure for its support. The Division at Washington was now devoting much attention to Agriculture, Sericulture and Forest insects in addition to the usual work upon insects injurious or beneficial to horticulture, fruit-growing and farming.

On the present occasion he would bring before the meeting an account of one only of their operations, as it was of especial interest and importance, namely, the Cotton Boll Weevil and the methods adopted for its control.

THE COTTON BOLL WEEVIL. (*Anthonomus grandis*, Boh).

This destructive insect made its first appearance in Texas in 1894 and has ever since been under the continuous observation of the Division of Entomology. Its life-history and habits have in this way been carefully and fully studied and many experiments have been carried out in order to discover some practical means of keeping it under control. Since its first appearance nine years ago, the insect has been spreading north and east at the rate of seventy-five miles per annum, but is still confined to the State of Texas. The territory occupied by it at the present time includes about 28 per cent. of the whole cotton area in the United States, and this affected region produced in the year 1900 no less than 34 per cent. of the total crop of the United States or one-fourth of the entire production of the world during that year. The vast importance of this investigation can thus be realized. The actual amount of damage caused by the weevil cannot be easily estimated, as the reduction of the crop in any particular year as compared with the average production may be largely caused by unfavourable weather and the attacks of other injurious insects. Making all allowance for this, it is a reasonable estimate that the State of Texas lost during 1902 at least ten millions of dollars through the injury caused by this insect. It is thus evident that the Boll Weevil is one of the most formidable menaces to a great agricultural and commercial industry that has ever arisen in America or elsewhere.

In addition to the loss occasioned at the present time, there must be taken into consideration the fact that the insect is spreading with great rapidity and will, before many years are over, infest the entire cotton-growing region of the southern States. In Mexico, where it has been a recognized pest for a much longer period of time, the only limit to its spread that has been observed is that of altitude; at 3500 feet above sea-level it ceases to exist, but unfortunately in the United States no cotton is grown at any such height above the sea. There is no probability that the insect will ever be exterminated: like many other injurious insects, when once established in a region where its food-plant is abundant, there it will continue to exist. It remains, therefore, to find out some means by which it can be kept under control and some plan by which cotton may be profitably grown. This important problem, it is believed, has now been virtually solved by the Division of Entomology.

Dr. Howard then gave an account of the measures that had been adopted. Last year (1902) the Division received a special appropriation which enabled it to conduct field work on a large scale and to practically test the system that promised the best results. A contract was made with certain planters who agreed to plant, cultivate and care for the cotton crop on their lands in exact accordance with the directions of the agent of the Division; in return an engagement was made that the owner should be fully compensated for any loss that he might sustain from failure to produce an average crop. Two large tracts of cotton, one of 200 acres, the other of 150, were secured in this way and the Division was enabled to apply any experiments that appeared desirable without incurring the labour and expense of renting the land and working the crop. The experience of previous years had demonstrated that a profitable crop of cotton could be secured, notwithstanding the presence of the boll weevil, by carrying out the following method:

Using seed from plants grown as far north as possible in order to ensure early maturity.

Planting as early as the season will admit, for the same purpose.

Cultivating the fields thoroughly in order to stimulate the growth of the plant and its early maturity.

Planting the rows as far apart as experience with the land shows to be feasible, and thinning out the plants in the rows thoroughly. The boll weevil thrives best where there is shade; when the rows are well apart there is a minimum of shade.

Finally, destroying by plowing up, windrowing and burning, all the cotton stalks in the field as soon as possible after the crop has been gathered—this should be not later than the first of October. The object of this is to kill all the weevils that are still about the plants and to leave them no protection.

By producing an early growth and maturity, the cotton may be harvested before the weevils had done very much damage. In ordinary methods of cultivation, the gathering goes on through all the autumn months and is only finished, perhaps, in December. The object should be to have the work of gathering completed by the first of October; then to burn up the plants and thus reduce very largely the attack of the weevil during the following year.

The experiments of the Division on this large scale attracted great attention throughout that region of Texas, and their success furnished an object lesson of great value to the planters, which the majority of them will now follow in their own practice.

Dr. Howard's clear and interesting address was listened to with great attention, and it came home to the minds of many of those present that similar practical methods might with advantage be adopted in the warfare against several other destructive insects. The thanks of the meeting were very heartily accorded to him.

Several of the members spoke of the very great disparity between the means furnished by the United States Government and our own in the warfare against noxious insects. It was agreed that every effort should be made to draw the attention of the Canadian Government to the advisability and the necessity of providing Dr. Fletcher with a sufficient staff of assistants and adequate means for carrying out investigations all over the Dominion and providing the community with the fullest possible information regarding insect attacks and the best methods of dealing with them.

A MENACE TO THE SHADE TREES OF LONDON, ONT.

BY REV. C. J. S. BETHUNE, LONDON.

The city of London, Ontario, owes its beauty and attractiveness to its broad streets lined with double rows of trees and its well-kept lawns and boulevards. If any wide spread injury were done to the trees it would be a very serious calamity indeed. It is well therefore to be on the lookout and not allow an enemy to become established if measures can be taken to prevent it. Unfortunately the great majority of the trees are maples; here and there may be seen a linden, a horse-chestnut, a honey-locust, a catalpa, and in the parks and gardens a few other trees, but those that line the streets are virtually maples. Any insect, therefore, that attacks these trees is likely to be found all over the city, and consequently the difficulty of dealing with it would be very great; wholesale measures would require to be resorted to and the expense involved would no doubt alarm the ratepayers. Under these circumstances it is well to sound a note of warning and draw attention to a menace which threatens the health, if not the life of the trees.

During the past summer anyone walking in the tree shaded streets could hardly fail to have noticed round stains upon the pavement, resembling large drops of rain, and in some places great patches of similar stains, blackened or dark brown in colour. These were caused

by a minute scale insect which was at work in countless millions upon the underside of the leaves (Fig. 8, e), sucking out the juices of the tree and excreting a sweet sticky fluid called

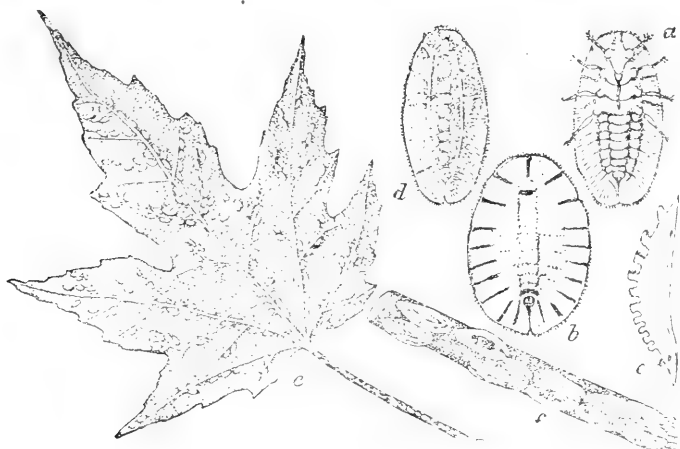


Fig. 8. Cottony Maple Scale: *a* Newly-hatched young; *b* Female from above; *c* Side view; *d* Male; *e* Same, natural size, on leaf and stem; *f* Same, enlarged—all greatly magnified except *c*. (From U. S. Dept. of Agriculture.)

“honey-dew,” which drips upon the leaves below, making their surface shine in the light, and then down to the pavement or ground beneath. On this honey-dew grows often a minute fungus, which gives it a dark colour and frequently forms black patches on the withering leaves. At the same time there could be seen hanging from the twigs, and here and there upon the

limbs, fluffy cottony tufts, pure white in colour; these are the female scale insects which cover their masses of eggs with this waxy substance. (Fig. 9.) A single individual produces one or two thousand eggs; when hatched the minute larvæ swarm over the nearest twigs and leaves for a few days and then fix themselves permanently on the under side of the

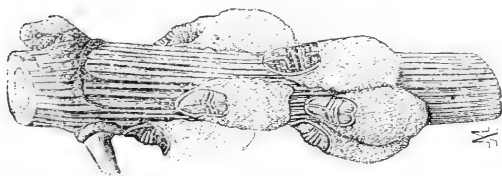


Fig. 9. Cottony Maple Scale: Female and egg-masses.

leaves, attaching themselves closely to the ribs; a few may occasionally be found on the upper surface and on the twigs. After a short time a waxy scale is formed, oval and convex in shape, completely covering the tiny insect.

The insect is called the Cottony Maple Scale (*Pulvinaria innumerabilis*, Rathv.), but is found upon a large number of other trees, and in London seemed to be more abundant upon the basswood (linden) than upon the maple, judging from the extent of the stains beneath the former trees and the drooping appearance of their leaves. Mrs. Fernald, in her recent Catalogue of Coccidæ, mentions no less than twenty-four food plants upon which it has been found; it is evidently then a general feeder and by no means particular in selecting an object of attack. Sometimes it is called the “Grape-vine Bark-louse” from its prevalence upon that plant.

Towards the close of summer these creatures have become mature, and about the end of August or early in September, the winged males, tiny little flies, appear; the females do not acquire wings but remain beneath their waxy scales. After mating, the males die and the females, before the leaves fall, migrate to the twigs and there remain during the winter. At

the opening of spring they grow rapidly and soon become distended with the quantity of eggs produced. In May or early in June the formation of the egg sac begins; this is composed of threads of wax extruded from the body in great numbers till they form the large cottony tuft already referred to. In this mass of filaments the eggs are deposited and there they remain till the end of June, or well into July, and then produce the myriads of orange coloured lice, thus completing the annual life history.

With so wide-spread an attack it seems almost hopeless to prescribe a remedy. Spraying with kerosene emulsion made with coal-oil and soap suds, will destroy the young lice, even using a diluted mixture, but not the eggs; it will therefore require to be repeated several times at intervals of about a week, as the eggs do not all hatch out at once. This should be done as soon as the young lice are seen to appear, usually about the end of June. Much may be done also by cutting off and burning or crushing the twigs infested by the cottony masses, as early in the season as they are first noticed; the appearance of the white tufts indicates that the female is producing her mass of eggs. A tree that is known to have been badly infested should be pruned in the winter and the cuttings burnt, as the scales hibernate on the twigs, and a large number may thus be destroyed.

Though the attack this year in London is general throughout the city and is certainly serious, some comfort may be derived from the fact that this injurious insect is usually kept in check by its natural enemies, especially by the lady-bird beetles and minute ichneumon flies, and probably by fungous diseases and sudden atmospheric changes. After a few years of abundance, during which it inflicts much damage, it often ceases for a considerable time to be noticeable. Outbreaks somewhat similar to the present, though perhaps not quite so serious, have been recorded at intervals. In 1898, for instance, Mr. R. W. Rennie mentioned in the Report for that year that this insect appeared in such numbers that "on one of the finest streets in the city (London) the trees looked as if they had been sprayed with whitewash."

In the discussion that followed upon the reading of the paper, Dr. Howard said that he thought the abundance of the scale this year was caused by the excessive moisture of the last two seasons. The chief parasitic enemies of the insect are minute ichneumon flies, which are unable to fly about and lay their eggs in wet weather; consequently the scales were not kept in check as they would be in fine dry weather. He had noticed that aphides thrive best in wet seasons, and evidently for the same reason. The usual experience was that there were rarely serious outbreaks of this scale for two consecutive years, as their natural enemies kept them in check.

THE PRESENT CONDITION OF THE SAN JOSE SCALE IN ONTARIO.

BY W. LOCHHEAD, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

It is now nearly ten years since the San José scale made its appearance in the United States east of the Rockies, and it is about seven years since it first appeared in Ontario. It has made progress in that time in spite of all the efforts which have been put forth to keep it under control. In the St. Catharines district there are but few orchards which have escaped invasion, and many have succumbed to the terrible attack. In the West the scale is very prevalent in South Essex and Kent. Although the scale is so wide spread in these districts, yet we must remember that if it had not been for the energetic action of the Government in appointing inspectors, and in passing the Fumigation Act for the treatment of nursery stock, in my judgment the scale would have spread to most parts of the Province.

Never before has the San José scale problem seemed so easy of solution as it is to-day. After long experimentation we now know that we have methods which are both effective and easy to apply. The whole solution of the difficulty lies now with the fruit-grower himself.

There are five more or less effective remedies—first the lime, sulphur and salt mixture ; second, crude petroleum ; third, crude petroleum and whale oil soap emulsion ; fourth, whale oil solution ; fifth, the McBain Carbolic Wash. With regard to the lime, sulphur, and salt mixture, its effectiveness was demonstrated beyond doubt by Mr. G. E. Fisher, and it is being extensively used, in the West particularly, as an effective remedy. The chief points of excellence of this mixture are ; first, its cheapness ; second, its effectiveness ;—third, its cleansing effect upon the tree from both insect and fungus pests. The fact that it is somewhat difficult to prepare and hard on the men and apparatus, has made this mixture unpopular with some of our fruit-growers. Where the fruit-grower has the proper appliances for making the mixture it does not seem so difficult as it appears.

The crude petroleum is well adapted in the West for apple treatment, and in the Chatham district I fail to hear of the death of a single tree. In that district the oil is easy to procure and the fruit-growers are well pleased with the results. The objections which have been urged against crude petroleum are : (1) the great variation in strength of the oil, (2) disagreeableness of application, and (3) the great liability of its injuring plums and peaches.

The emulsion of crude petroleum and whale oil soap, although a very effective remedy, has never taken well with the fruit-growers, on account of the difficulty which was found in making the emulsion and of the disagreeableness of the application.

Whale oil soap solution although quite effective when properly applied proved too expensive for the average orchard, and has been given up.



Fig. 9 a W. W. Hilborn's appliance for making the lime-sulphur-salt mixture.

The McBain Carbolic Wash is a new insecticide which has been tried for the first time in Canada this summer and has given good satisfaction wherever it has been tried. Further

experiments are necessary however, to determine if the winter applications of the carbolic wash will prove as successful as the summer applications.

The lime, sulphur and salt treatment, which the Essex fruit growers are using quite freely, is extremely cheap. Mr. J. D. Wigle, of Kingsville, tells me that it cost him but ten dollars for outside help to spray forty apple trees and eight hundred peach trees with this mixture. Mr. W. W. Hilborn, of Leamington, is also quite enthusiastic over the mixture. He had some hesitation last spring in using it, but when he came to prepare it he found it much simpler than he had expected. He used a boiler, which he procured for ten dollars, to supply the steam for boiling the mixture. He used the 15, 15, 10 formula. The lime he slaked slowly in a coal-oil barrel with four gallons of water; then the sifted sulphur was added with stirring to the hot mixture, and the whole boiled for an hour; then the salt was added and the mixture boiled for half an hour longer. Mr. Hilborn kept a second barrel of hot water always convenient. This mixture was very effective, and I failed to find a single scale at the time of my visit, August 27th. It was applied also against the Scurfy Bark Louse and the Oyster Shell Bark Louse, and the results were extremely satisfactory. The township of Gosfield in which Kingsville is situated passed a by-law last spring compelling treatment of infested orchards, and a township sprayer, Mr. H. Bruner, was appointed to do the work whenever the owner himself cared not to spray. The results were quite satisfactory to most of the fruit-growers, and they see now the solution of this problem of the San José Scale. In the St. Catharines district, however, the lime, sulphur and salt treatment has not become popular, but no one seems to doubt its effectiveness against the scale. Mr. G. A. McBain has had a very interesting experiment under way, testing the effectiveness of his "Carbolic Wash." (Plate 1.) He undertook to clean up the Henry Kottmeier orchard which contains about four hundred trees, mostly plum of five years' growth. Mr. McBain has given the orchard three applications. The first was made with his winter wash on the 28th and 29th of April, the second with the summer wash on 14th and 15th of July, the third with his summer wash on the 14th and 15th of August. The winter application, although fairly satisfactory, did not kill all the scale, but as large a percentage as one could naturally expect from the encrusted condition of the trees. Besides Mr. McBain tells me that he could now guarantee a much larger percentage of scale killed because he was afraid to use a stronger formula than the one he had been using in California. I examined the orchard on the 14th of August, before the third application, and found but few scale on the trees. The trees looked healthy and had made a decided growth. Some of the leaves of the trees had been singed by the summer mixture, but I think no appreciable damage would be done.

The McBain Carbolic Wash has been in use for some years in California as a scale remedy. It is a black, oily liquid, and smells strongly of crude carbolic acid. The other ingredients are pine tar and fish oil. The strong point in favor of this wash is the readiness and ease with which the spraying liquid can be prepared. When a barrel of liquid is to be made up, 2 or 3 gallons of the black Carbolic Wash are placed in the barrel and cold water added. The wash dissolves very readily, and the barrel of liquid has a milky appearance. Another feature of the preparation is that its application by the spray pump is not an unpleasant operation. The operator does not need a special suit of old clothes, as he does if he were spraying crude petroleum, whale oil soap, or the lime, sulphur and salt mixture.

In my judgment the points of the McBain Carbolic Wash which I have indicated are very important ones in future operations against the San José scale, for experience proves that the ordinary fruit-grower is influenced mightily by the character of the spraying operation. I believe that the main reason why the crude petroleum, and the other preparations which are effective against the scale, did not take with the people was this very factor—the disagreeable

nature of the spraying. As we all know, a perfect insecticide must possess the following qualities :

1. It must be effective against the insect ;
2. It must not harm the plant ;
3. It must be readily and easily applied ;
4. It must be cheap.

From my observations this McBain Carbolic Wash possesses at least three of these qualities, and it may have the fourth also, for I do not know what the retail price of it will be. This is an important point, but if the manufacture of the substance is to be made a business matter, then I have not much fear on this point.

In addition, there is ground for the belief that this wash is valuable not only for controlling the aphid of apple, plum and cherry, but also as a fungicide for peach leaf curl, apple scab, and the brown rot of plum, when used at the rate of 1 to 30.

Now as to the future of the San José Scale. I do not advocate that the Provincial Government should continue to lay out large sums of money every year in fighting the Scale. They might with just as good reason be asked to spend money in fighting the Potato Beetle, the Codling Moth, or the Hessian fly. The Government, I maintain, has done its duty with regard to the Scale ; and now that reliable, efficient remedies are known, the matter of controlling the pest must remain with the fruit-growers. I am sure that the Government is willing to assist the fruit growers with advice and even with help when necessary.

This help should come in the form of reduction of cost of chemicals, as has been given in previous years, and in establishing a system of Township Sprayers under Governmental supervision, perhaps. To my mind the greatest need at the present time is not a new remedy, for we have efficient ones already, but an organized system of sprayers by whom every orchard can be sprayed at a reasonable cost, at the proper time, and in the proper manner. Many of our smaller fruit-growers have neither the outfit for doing good work, nor the time and help to spray at the proper season. They would be perfectly willing, however, to pay for the spraying of the orchards by a reliable party. In Gosfield Tp., Essex County, a township sprayer was appointed last spring, and so far as I could learn from inquiries in the vicinity, the fruit-growers are thoroughly satisfied with the results. A prominent grower told me that he no longer feared the Scale so long as he could get his orchard sprayed with the lime, sulphur and salt mixture, and by reliable sprayers at a reasonable cost. (See Plate 4.) A St. Catharines fruit-grower thinks the McBain Carbolic Wash solves the difficulty in regard to keeping the Scale in check. He thinks that there will now be no difficulty in finding good sprayers to do the work since the wash is not disagreeable to use. He said that his own men looked upon the spraying operations with crude oil, or the whale-oil soap, as a veritable ordeal.

There is another matter in regard to the Scale which should be attended to as soon as possible. In the scale infested sections there are orchards which are never sprayed. As a result they are neglected, and they form veritable breeding grounds for the Scale and other pests. I know of several orchards which are thus neglected (Plates 2 and 3). It is not fair to the other fruit-growers that they should be exposed to such conditions.

The townships should see to it, and pass a by-law compelling the spraying of the neglected orchards, or to have them cut down and burned. The Government might very reasonably look after the inspection necessary for the proper carrying out of the by-law. We all know how such a by-law would soon become a dead-letter through difficulty in getting the local authorities to carry out its provisions. An outsider can carry on the work, but a local man cannot.

Furthermore, fruit-growers must recognize the necessity for at least one spraying every year. In badly infested orchards two sprayings should be made.

Finally, good spraying outfits—a 5-ply hose—not an ordinary garden hose, should be used.

NOTE ON THE GREAT LEOPARD MOTH.

Epantheria scribonia, Stoll.

BY REV. C. J. S. BETHUNE, LONDON, ONT.

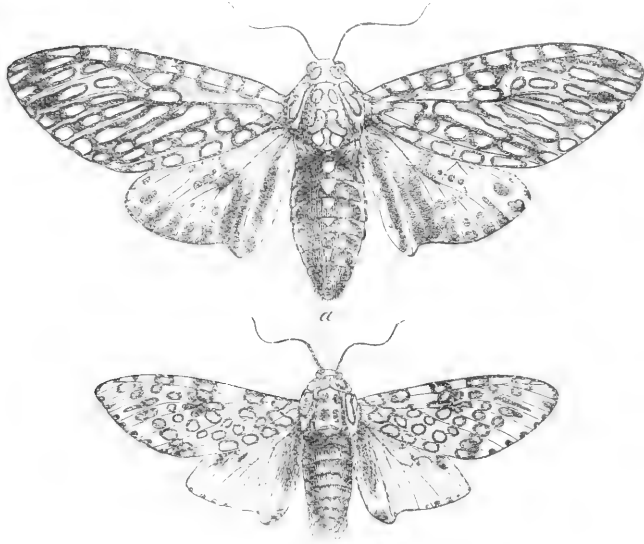


Fig. 10

On the 6th of May, 1903, in a wood some six miles south of London, I had the good fortune to find a large hairy larva, rolled up in a ball and occupying a round cell that it had made of dried leaves beneath a log. As Mr. Arthur Gibson, of the Experimental Farm at Ottawa, was then engaged in the study of the Arctiidae in connection with his valuable paper on the genus *Apantesis*, recently published in the *Canadian Entomologist*, I sent the specimen to him. A few days after it reached him—on May 11th—it assumed the pupa state and on the 4th of June the imago appeared. To our mutual delight, it proved to be the Great Leopard Moth (*Epantheria scribonia*, Stoll).

Though this moth is rarely taken in Canada, the larva is occasionally found in the autumn when it is full grown and in the spring, as in the present instance; it hibernates under logs, the loose bark of decaying trees or other suitable hiding place. Whether or not it takes any food in the spring before changing into a chrysalis is a matter of doubt. The specimen referred to evidently did not, as I found it in its winter quarters and it had no food after its capture. The food-plants, so far known, are the Willow, wild Sun-flower (*Helianthus decapetalus*), Poke-berry (*Phytolacca*), and Plantain.

Mr. Gibson has kindly furnished me with the following careful description of my specimen when it reached him:

“Length 43 mm. General appearance—a stout, black larva, with stiff, shiny, jet-black bristles. Head 4 mm., wide, subquadrate, flattened in front, only slightly bilobed at vertex, black, shiny excepting posterior upper part of cheek near segment 2, which is pale brownish; median suture and epistoma dull whitish; mandibles slightly reddish; hairs on face mostly black, reddish at tips. Body stout, dull black, with patches and streaks of velvety black on dorsum; distinctly yellowish in the incisures; lower lateral and ventral surface paler. Tubercles large, all black, excepting vi., vii. and viii., which are a dark amber colour, each bearing a bunch of stiff, black, barbed bristles; from v., vi., vii. and viii. many of the

bristles are tinged with dark red. Tubercles i., ii. and iii. are nearly the same size, iv. elongate. Spiracles dull orange, anterior and close to, but above tubercle iv., on abdominal segments. All the feet shiny brown tipped with black." (Fig 11).

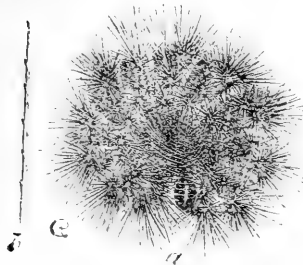


Fig 11. Larva of Leopard Moth.
b spine magnified.

This larva, it will be observed, differs somewhat from Abbot and Smith's figure (Lep. Insects of Georgia, p. 137, plate 69) and other descriptions, in that the specimen was all black except the narrow yellowish shading in the incisures. The e was: no red bands between the segments.

The moth, shewn in the accompanying figures, (Fig. 10, after Riley) *a*, the female, *b*, the male, is a very remarkable and beautiful creature. The wings, head and thorax are white, and covered, except the hind wings, with rings or spots of black; the hind wings of the female have an outer border of blue-black spots, and of the male a long black stripe, terminating in a spot near the inner margin; these markings, however, are variable, in some specimens the spots are all rings and in others filled with black or brown. The upper portion of the body is steel blue in colour, with—in the female—a lateral stripe of orange and a row of dark spots. The wings of the male expand about two inches and a quarter, while those of the female are fully three inches from tip to tip.

A CARD SYSTEM FOR NOTES ON INSECTS.

BY ALBERT F. WINN, WESTMOUNT, QUE.

The myriads of curious and interesting facts, which the student of entomology is certain to observe, make it necessary to have something more than the memory to rely upon. For field notes a pocket memorandum book is indispensable, but for reference these notes must be transcribed into some form in which one can classify the subjects to some extent. I have tried various sorts of books, large and small, the most satisfactory having been a ledger with a page or half page reserved for each species about which any notes were made. The index in the book served to find the page of any desired subject. But there were many ways in which this was unsatisfactory; the book was necessarily large, in many cases pages were left for species on which only a few lines were used, while in others not nearly enough space was left and notes had to be marked "continued page 260" etc. Arrangement of species as to scientific order was impossible, and notes on species described as such, which afterwards proved to be synonyms were hundreds of pages apart.

I do not know who invented the card index system but you are doubtless familiar with one or more of the countless varieties of these time-saving devices, which can be adapted to almost every form of business, and which are "always complete but never finished." The standard size of card used is about 3 inches by 5 and these already cut and ruled with faint lines are to be had from city firms handling office supplies, as can also the cards for dividing and indexing the different genera, and alphabetical index. It is well to use cards that are thin, because they will not take up so much space, and a great many cards will be required to keep adequate notes on the subjects that we try to work up.

I found it necessary to have three distinct parts to make the index complete—a diary, in which to keep track of notes in order as to date of observation; an alphabetical index; and a series of cards one or more for each species about which any records are made. For the diary portion I begin with a colored card marked 1903—followed by divisions for the various months, parts of the cards being slightly over the 3 inches high so as to show the name above the cards

on which the notes are recorded—January February March could be put together, as references would likely be few. A card for each day on which anything is noted is inserted in its place according to date. This makes a very compact record of the year's captures, and additional notes on species observed by fellow collectors, which one hears about a week or more later, can be dropped into their proper place in a manner quite impossible in any book. To cross index this the alphabetical index is required. Let us say a trip to Quebec is taken August 21st to 24th, 1902. Separate cards mentioning each day's notes are put in place in the diary behind the August card and in the alphabetical index a card is inserted, behind letter "Q", headed *Quebec*.: "Spent a few days at Quebec Aug. 21-24 1902." On the Quebec card would also be noted references to published papers on insects found at Quebec, etc.

If a species of interest is taken, say *Pamphila Manitoba*, a card headed with the name of that species is marked "1 specimen Island of Orleans, Quebec, 21-viii-02, on everlasting flowers, A. F. W." All further original notes, or references to published matter are put on this card till filled, when a second card may be used. To find the cards quickly, they are arranged alphabetically behind a genus card whose name shows at the top, and the genera are arranged in families in the same order according to some List. Perhaps it would be more consistent to arrange the genera alphabetically also, but it seems easier to look for *Grapta* next to *Vanessa* than to work alphabetically. When a new List appears, and the names get changed around, a few cards will have to be inserted here and there indicating that the genus *Hepialus* has been transferred to the *Micros* or elsewhere, or that some genus has been divided into a dozen or so. The alphabetical index could be used as a sort of directory.

For life-history work the cards seems specially useful, as an unlimited number of cards may be used numbered consecutively, keeping track of egg, various stages of larva, chrysalis and imago. If a stage or more is missed one season, the information can possibly be obtained another year and another card inserted in its proper place.

ADDITIONS TO THE SYRPHIDAE OF THE PROVINCE OF QUEBEC.

By GUSTAVE CHAGNON, MONTREAL.

Since the publication in 1901 of my "Studies on Canadian Syrphidae" in which were described about 90 species of these flies, more material was collected and carefully examined. Amongst this material, some of which was collected by Mr. Stevenson, of Montreal, and Abbé Roy, of Lévis, were found several important additions to my list. The following is a brief account of these additions.

Criorhina armillata, O.S. One ♀ specimen was captured at Piedmont, on 7th June, 1902, by Mr. Charles Stevenson. This species is quite different from those already given in my "Studies" by its black abdomen and by the anterior cross vein which is nearly rectangular and placed slightly before the middle of the discal cell.

This species was described by Osten Sacken in 1878, from one ♀ specimen taken at Quebec. Its geographical distribution seems to be northern as I cannot learn of its capture in the United States.

Merodon equestris, Fabr. Taken at Outremont, on 7th July, 1901. This specimen is doubly interesting as being perhaps the only capture in the new world of a species belonging to an European genus of which no representatives have been recorded in North American lists. It is closely allied to *Eris'alis* by its front being evenly arched and the third longitudinal vein being strongly bent into the first posterior cell.

Pipiza nigripilosa, Will. This species is easily separated from the others by having a long black pilosity on its body. It was captured by myself at Sherbrooke, on 30th May, 1902, while collecting with Abbé Begin of that place.

Platychirus peltatus, Meigen, ♂. Like the preceding, this species was taken at Sherbrooke, on 30 May, 1902. It appeared to be quite common and about 10 specimens were taken in a short time. The front tibiae of the ♂ are suddenly dilated at the tip; the front metatarsi much dilated, the remaining joints but slightly so. The other two species occurring in our fauna, are *quadratus* and *hyperboreus*. A Sherbrooke specimen said to be *chutopodus* was sent to me for study, but I could not verify it on account of the bad condition in which the specimen was.

Leucozona lucorum, L. One ♂ specimen received from Abbé Roy, of Levis. This species was recorded from Canada by Osten Sacken a good many years ago. It is a handsome syrphid, the basal half of the abdomen being yellow and the remaining half black.

Syrphus amalopsis, O. S. Captured 2 specimens at Sherbrooke, 30 May, 1902. This species looks very much like our *umbellatarum*, but the bands are club-shaped at their inner ends.

Piropheena ocymii, Fabr. I had the good fortune to take one ♀ of this species at Maisonneuve in August last. In structure, they are closely allied to *Melanostoma* and *Platychirus*, but distinguished by the flattened abdomen which is a long oval in shape and more narrowed towards its base, so that its greatest width is attained at the end of the third segment; the wings are also shorter and broader, scarcely projecting beyond the end of the abdomen. This species is also European.

Mr. Winn kindly gave me a ♂ specimen captured near Montreal a few years ago.

Sphegina lobata, Loew. I have just received one specimen of this species from Abbé Roy, Levis. Differs chiefly from *rufiventris* by its black body with yellow spots on the abdomen.

AN INTERESTING ENEMY OF THE IRIS.

By ARTHUR GIBSON, DIVISION OF ENTOMOLOGY, CENTRAL EXPERIMENTAL FARM, OTTAWA.

In Dr. James Fletcher's Entomological Record for 1902 published in last year's report, the following note appears: "*Macronoctua onusta*, Grt., two specimens reared from larvae feeding in and on stems of *Iris versicolor*, L., emerged 3rd Sept., Montreal (Winn)."

In July last the writer noticed that some borer was at work in the Iris beds at the Central Experimental Farm, and upon investigating further, specimens of a noctuid larva from which were reared moths of *Macronoctua onusta*, Grt., were found in different stages of development. These caterpillars were first collected on the 28th July, and at that time their presence in the beds could easily be detected by the discoloured, partly dead leaves of the plants. The Irises which were chiefly attacked were *Iris spuria*, L. and *Iris biglumis*, Vahl., although specimens of the larva were found working in several other species. These larvae first attacked the stems some inches above the ground and gradually worked downwards, the mature caterpillars being found right in the roots below the surface of the ground.

The occurrence of this larva at Ottawa, particularly in destructive numbers, is very interesting. The moths are rare in collections and there is only one record of the insect having been taken here previous to this year, viz. an imago on the 29th Sept. 1902, by Dr. Fletcher.

Like other borers, these larvae are smooth and not particularly beautiful. When mature they measure about an inch and a half in length, and in general appearance are flesh-coloured caterpillars with a more pronounced pinkish tinge above the spiracles. The head is a rich chestnut red, shiny, rounded, but rather wider than high, bilobed, flattened in front; margins of clypeus and mouth parts darker than the rest of the head; ocelli black; lateral edge of cheek touching segment 2 black. Body cylindrical, plump when full grown, but before maturity rather flattened dorsally as if starved. Thoracic shield shiny, slightly wider than head, teal-

taceous, darker at margins, traversed in the centre of dorsum by a pale line. Tubercles inconspicuous, black, No IV. lying behind the spiracle. Spiracles conspicuous, elongate, black. Anal flap and thoracic feet testaceous; prolegs concolorous with venter, claspers black.

On the 30th July one larva entered the earth in the breeding jar for pupation, and within the next week or so other specimens also buried. The pupa is 21-24 mm. in length and 6-7 mm. wide at widest part, chestnut brown, shiny; anterior margin of abdominal segments minutely pitted, posterior margin conspicuously pitted. Cremaster dark, almost black, bearing two stiff capitate spines at extremity and three others on either side above—in all 8 spines. The first moth emerged on the 9th Sept., and other specimens appeared soon afterwards.

BASSWOOD, OR LINDEN, INSECTS.

BY ARTHUR GIBSON, DIVISION OF ENTOMOLOGY, CENTRAL EXPERIMENTAL FARM, OTTAWA.

The insects which feed upon the basswood, or linden, tree have not of late years, as far as the writer knows, been given special attention by any Canadian students of forest and shade-tree insects. Since the appearance of the chapter on "Insects Injurious to the Basswood, or Linden, Tree," which appeared in the Fifth Report of the U. S. Entomological Commission—Insects Injurious to Forest and Shade Trees—by Dr. A. S. Packard, nothing of length has been published that we are aware of. During the past three years we have, however, endeavored to note particularly the insects which feed upon the basswood tree, and in the preparation of this article frequent use has been made of the published notes of other observers. In some of the back reports of our Society excellent articles have appeared on the insects which have been found feeding on certain of our native trees, and it is hoped that other members will continue the study of insects which attack the same kinds of tree, so that our knowledge of forest insects in general may be thereby increased.

In Canada the only native species of basswood is *Tilia Americana*, L. with its variety *pubescens*, Loud. The typical form is abundant throughout Ontario and Quebec and extends from New Brunswick as far west as Manitoba. In his Catalogue of Canadian Plants, Macoun states that the variety *pubescens* occurs about Quebec, along the shores of Lake St. Clair, and near Sandwich, Ont. The European Linden, *Tilia Europaea*, L. has been cultivated and extensively planted in many of our towns and cities, and may be frequently found growing in parks and on lawns as an ornamental tree. It is apparently quite hardy and thrives well in our climate. Another species, *Tilia heterophylla*, Vent. is common in woods in the eastern United States, from New York to Florida.

The lumber of basswood is light, soft, but rather tough, and, as one of the woods known as "whitewood" is largely used in the manufacture of drawers and similar cabinet work, cheap furniture, woodenware, etc. Many of our boatbuilders purchase quantities of this timber for making small boats and canoes, and owing to the fact that the wood can be bent readily it is also used for dashboards of carriages. For many years the wood has been used, particularly in the Province of Quebec, for making snow shovels, and even to-day wide use of the wood is made for this purpose. In Europe the inner bark, known as bast, which gave origin to the common name, is largely used in making coarse cordage and matting, but this industry has never attained any importance in America.

The value of the linden as a shade tree is well known, and the following paragraph taken from Farmers' Bulletin No. 99, U. S. Department of Agriculture—Three Insect Enemies of Shade Trees, by Dr. L. O. Howard—is of special interest here.

"In selecting shade trees, particularly for small cities and towns in agricultural regions, and even to a considerable extent in large cities, the relative honey-producing qualities of the

proposed shade trees is a matter of some little importance ; not so much perhaps, in the matter of actual food for the ordinary honeybee as in that of the increase of bees on account of their great value as cross fertilizers of orchard trees and forage crops. From this point of view there are five very important honey producers among the principal shade trees. These are, in order of importance : American linden, tulip tree, black locust, horse-chestnut, and sugar maple."

When insects occur in destructive numbers in our forests it is an exceedingly difficult matter to bring to bear any remedial treatment, in fact in most instances it is impossible to cope with these enemies. In cases, however, where basswood trees are grown, or allowed to stand, for ornamental purposes, it is usually possible, when such are attacked by insects, to apply a remedy. As it has often been stated in these pages, insects from a practical point of view may, roughly speaking, be divided into two classes, viz. those kinds which bite their food, such as caterpillars, and those which derive their sustenance by sucking up their food in a liquid form, by means of their beaks, as plant lice. For the first class some poison, such as Paris green, must be applied to the foliage, which will be eaten with the same, but for the second class some liquid, like kerosene emulsion, or whale-oil soap, which will kill by contact, must be used. There are, however, many insects which bore into the wood of the tree, and which cannot be reached by any of the above remedies. Usually, however, it is only trees which have been injured in some way, as by lightning, or wind, or are in an unhealthy condition, that are resorted to by the mature females of these boring insects for egg laying. For these, remedies of a preventive nature are usually adopted, one of the best of which is to wash the trees, particularly the trunks with some deterrent or malodorous mixture which has the effect of preventing the females from laying their eggs.

Insects, therefore, which feed upon the basswood may be divided as follows, viz :—

- Those which attack the foliage,
- Those which occur on the bark,
- Those which bore into the wood.

The following list of species covers all we have noted at Ottawa, as well as many which have been recorded by other writers in the various, somewhat limited, publications at our disposal.

ATTACKING THE FOLIAGE.

ORDER HOMOPTERA.

1. The Linden Tree-louse, *Lachnus longistigma*, Monell. This is a species of plant louse which feeds on the leaves, by means of its beak, through which it sucks up the juices. It is found in Canada in late summer but does not occur anywhere in injurious numbers.

2. The Obtuse Clastoptera, *Clastoptera obtusa*, Say. This is one of the tree hoppers, and is recorded by Lintner in his report for 1891, as having been found on linden. The insect occurs at Ottawa, but has never appeared in Ontario, Dr. Fletcher tells me, in injurious numbers. Van Duzee recorded it as common on blueberry in the Muskoka Lakes District.

ORDER HEMIPTERA.

3. The Basswood Aphis, *Pterocallis tilie*, L. has been very abundant at Ottawa the past season. Early in July the plant lice were numerous in all stages, and specimens were kindly identified by Mr. Theo. Pergande, through the courtesy of Dr. Howard. This plant louse is a beautiful aphis, and like other aphids can be held in check by spraying with whale oil soap, or kerosene emulsion. The trees attacked were covered with honey dew and blackened by the fungus *Fumago salicina* which grows thereon.

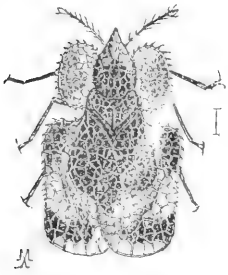


Fig. 12. A *Tingis* (greatly magnified).

4. *Tingis tiliae*, Walsh. This beautiful little lace-like plant bug (Fig. 12) may frequently be found in small colonies beneath the leaves. It cannot be said to do much injury to the trees.

ORDER COLEOPTERA.

5. The Linden Leaf-beetle, *Chrysomela scalaris*, Lec. This attractive beetle occurs commonly on the linden in Ontario, and attacks the foliage both in the mature and larval stages. The perfect beetles are beautiful insects, with their silvery wing-covers spotted with green. The larvae are thick bodied, white, with a lateral row of black dots.

6. *Chrysomela pvirsa*, Stal. Mr. Harrington tells me that he has twice taken this handsome species upon the leaves of basswood near Hull, Que., in July—three specimens in all. Dr. Fletcher also has specimens taken at Billings Bridge, Ont.

7. *Odontota rubra*, Web. This is a common insect on basswood, but it has never been the cause of noticeable injury in Canada.

8. *Odontota rosea*, Web., is also a common species on the linden, but like the preceding does not do any particular injury. The larvae, which are of a yellowish white colour, when hatched eat their way into the interior of the leaf, feeding on the soft tissues within, the skin being left entire.

9. *Brachys arosa*, Melsh. This pretty little buprestid has been reared several times by Dr. Fletcher, from blister mines in the leaves of basswood, the beetles emerging in May.

10. The Strawberry Weevil, *Anthonomus signatus*, Say. This common enemy of the strawberry is recorded by Dr. Hamilton, (Can. Ent. XXIV., p. 41) as eating the leaves and blossoms of *Tilia*. This weevil does considerable harm to strawberry plants in Canada. Just before the flowers expand they are severed from their stems by the female weevil, which pierces the buds and lays one white egg in each, which afterwards hatches into a white grub, passing all its stages inside the fallen bud, eating out the centre and forming a round cocoon or pupa case of the frass, within which it turns to the beetle. (Fletcher, Rep. Dom. Exp. Farms 1890). At Ottawa we have noticed that some insect has been at work within the seeds of the basswood, but we have not as yet found any actual specimens. It is possible that the species may prove to be *A. signatus*, but this, of course, is merely conjecture.

ORDER LEPIDOPTERA.

11. Forest Tent Caterpillar, *Malacosoma disstria*, Hbn., is one of the most important of our foliage-eating forest insects. When abundant it causes widespread destruction, attacking the basswood as well as many other trees.

12. Apple-tree Tent Caterpillar, *Malacosoma americana*, Harr., is also injurious to forest as well as orchard trees, although it is more widely known as destructive to the latter. During seasons when this and the preceding species are abundant, larvae of both kinds may be found feeding together and living in the same nests. In the Annual Report for 1898, Mr. Harrington reported that *C. americana*, Harr. and *C. disstria* Hbn. "stripped bare many acres of aspen poplar, basswood and maple groves" in the Ottawa district. The life-histories of both these tent caterpillars, as well as the remedies, are well known, and have been mentioned many times in the reports of our Society.

13. The Fall Cankerworm, *Alsophila pometaria*, Harr. These larvae have been very destructive to the foliage of basswood, at Ottawa, every spring for some years. During the past season they were particularly abundant defoliating, and making unsightly, trees of many kinds, the linden and elm coming in for more than their share of injury. These caterpillars have long been known to the practical entomologist, and many experiments have been conducted to eradicate them. The remedies now recommended against cankerworms are,

spray the trees with Paris green, or some other arsenical poison, and to band them with a mechanical protector, some kinds of which have been used with success. Bands of sticky substances may also be placed around the trees to be protected, to prevent the female moths which are wingless, from climbing up the trees to deposit their eggs.

14. The Spring Cankerworm, *Paleacrita vernata*, Peck., hatches from the egg at the same time as the preceding species. Both these cankerworms are similar in appearance, and have the same habits. The Fall Cankerworm moth emerges in the fall, and the Spring Cankerworm moth, in the spring. The caterpillars are slender loopers about an inch and a quarter in length, and vary in colour from greenish-yellow to dusky, or even dark brown, marked with black.

15. The Lime-tree Winter moth, *Erannis (Hybernia) tiliaria* Harris. This is another common insect, the larvae of which are often abundant in Ontario and Quebec, some seasons doing considerable injury. The caterpillar is one which has the power of travelling very quickly from one point to another, and consequently when the species is numerous the injury is widespread. These larvae when full grown are about an inch and a quarter in length, and in general appearance are bright yellow loopers with a dull red head, and many longitudinal

black lines on the body, the under side of which is paler. (Fig. 13.) They reach maturity towards the end of June and then descend and enter the ground for pupation, the moths appearing in October and November. The female moth is wingless, and the habits of the species in general are similar to those of the Cankerworm, so the same remedial treatments may be adopted.

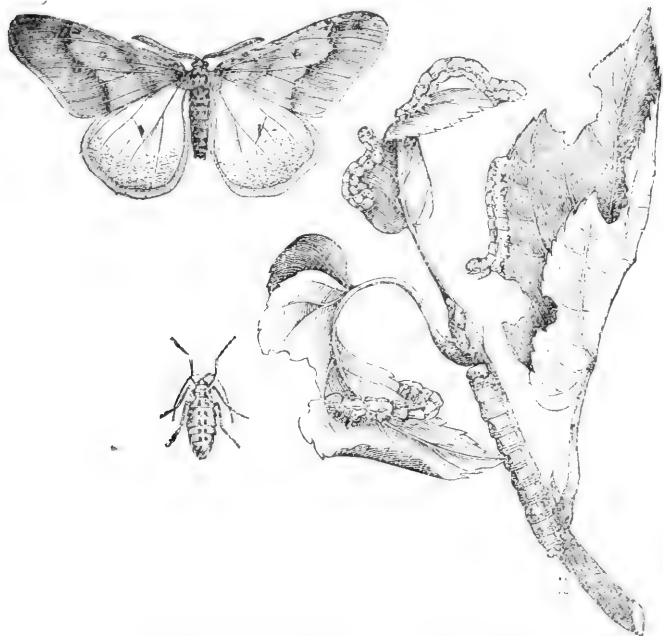


Fig. 13. Lime-tree Winter Moth; Male and female moths, and caterpillars.

they have hatched, the moths appearing the following year. These caterpillars are best known from the damage they do to the foliage of the apple. They are interesting in view of their feeding habits and the curious position they assume when at rest. When mature they are about an inch and a half in length. The body is black covered sparsely with long white hairs, and is marked longitudinally with four greenish-yellow stripes on each side. The head is shining black, and the body just behind the head bears a conspicuous yellow shield from which the caterpillar derives its common name.

17. The Basswood Leaf-roller, *Pantographa linata*, G. & R. A common sight some years where basswood trees are numerous, is single leaves cut across from near the middle, and the end portion rolled up like a tube. The insect which causes this is a pyralid larva, which

16. The Yellow-necked Apple-tree Caterpillar, *Datana ministra*, Drury. Colonies of these larvae are occasionally met with on basswood trees. At Ottawa on the 25 August we have found the young larvae just after

fastens the portion of the leaf as it rolls it with threads of silk. It is bright green, about an inch in length, with a black head and shield of the same colour on the back close to the head. The body is spindle-shaped and bears brownish warts. Like other pyralid larvæ, it is very active in its movements when disturbed. The moths fly at Ottawa late in June, and again in August.

18. *Xylina Bethunei*, G. & R. The caterpillars of this noctuid moth were quite plentiful near Ottawa, on the 5th June, 1903, attacking the foliage of basswood. They were at that time nearly full grown, about an inch and a half long, of a pale greenish colour, with a yellowish dorsal stripe, and had white tubercles. Specimens collected pupated shortly after that date, the moths emerging from the 17th to 26th September.

19. *Ennomos alniaria*, Linn. Dr. Packard states that this common larva was found on the linden by Dr. Harris in August and September. Other writers also refer to the larvæ, as feeding on basswood.

20. *Catocala cerogama*, Gn. On the 31st May, 1901, Dr. Fletcher and the writer found eleven full grown larvæ of this *Catocala* on a large basswood tree near the Experimental Farm. These caterpillars were over two inches in length, and four of them were greenish, while the remainder were grayish. They all spun their cocoons in about a week's time, and gave us the perfect moths about the middle of July.

21. *Automeris (Hyperchiria) io*, Fab. Nearly full grown larvæ of this well known species were beaten from basswood by the writer on the 15th August last at Meech lake, near Ottawa. Mr. Winn tells me that these caterpillars were very abundant on St. Helen's Island, near Montreal, during August, 1901. This insect is well known in the mature form, and is



Fig. 14. *Io* caterpillar (full grown).

common "at light" in many parts of eastern Canada. The larvæ, however, are seldom abundant enough to be considered very injurious. They have the habit, particularly when in their earlier stages, of feeding in serried ranks, and on this account attract attention when noticed. The mature caterpillar (Fig. 14) is a beautiful creature, pale green, with tubercles bearing stiff spines of the same colour. Along each side of the body on the abdominal segments is a bright reddish band broadly edged with white below. The spines from the tubercles are very sharp and possess strong urticating properties, so are capable of giving a painful sting if the caterpillar is handled at all carelessly.

22. The Brown-tail moth, *Euproctis chrysorrhæa*, L. This is a European insect which was accidentally introduced into the State of Massachusetts some years previous to 1897—the season its depredations were first brought to public notice. It is thought that the insect was brought to that locality, on imported roses, from Holland or France. Since 1897 the Brown-tail moth has done an enormous amount of injury, its favourite food plant being the pear, but among the many other trees and shrubs which it has attacked, considerable damage has been done to the foliage of basswood trees, both *Tilia Americana*, and *T. Europea*. There is only one record of the insect having been taken in Canada, viz. a single specimen of the moth at St. John, N. B. last year by Mr. W. McIntosh. A valuable account of the introduction into Massachusetts and also of

the spread of the insect, with life history, remedies, etc., has lately been published by Dr. C. H. Fernald, and Mr. A. H. Kirkland.

23. The Fall Web-worm, *Hyphantria textor*, Harr. This insect is also a very general feeder, and when the larvae are numerous, the basswood suffers almost equally as much as do many other trees attacked by this well known pest. This insect, as its common name implies, makes unsightly webs, at the tips of the branches, but as it occurs rather late in the season its injury is not so serious as it would be if the caterpillars appeared earlier. When mature the larva is rather over an inch in length and varies much in colour, some specimens being pale yellowish, or greenish, others much darker almost a bluish black. An easy way of dealing with this pest is to cut off the webs as soon as they are noticed and destroy the contained caterpillars by crushing them under foot.

24. The White-marked Tussock Moth, *Hemerocampa leucostigma* S & A. is one of the best known enemies of shade trees. In Canada probably the tree which has suffered most from the larva of this species is the horse-chestnut, but when the insect is abundant it attacks basswood, as well as other trees. In Toronto for many years the species has been very destructive to shade trees. It can, however, be controlled easily by spraying with arsenical poisons, and by the collection of the conspicuous egg masses during the winter. The caterpillar is about an inch and a quarter in length when full grown, with a chestnut red head, just behind which is a conspicuous coral red mark, and two small elevations of the same colour posteriorly. On the back there are four white brush-like tufts, two long black plumes near the head and one at the anal end. The body also bears slender hairs, and a wide black band down the centre of the back, and a still wider band not so black on



Fig. 15. Tussock Caterpillar.

each side; between these bands the colour is golden yellow, and the skin just below the spiracles is also yellow.

25. The Red Tussock Moth, also called the Old Tussock Moth, *Notolophus antiqua*, L. Larvae of this species in all stages of development have been found feeding on the foliage of basswood, but while common the caterpillars never occur in sufficient numbers to do noticeable injury. The larva of this Tussock Moths differs from that of the preceding species in being much less gaily coloured and lacks the bright red head. It also has an additional pair of black pencils arising from the sides of the second abdominal segment.

26. The Polyphemus Emperor Moth, or American Silkworm Moth, *Teia polyphemus*, Cram. The larva of this common Emperor Moth has been occasionally found on the basswood at Ottawa. During the past season the writer found a single egg of this species on a linden leaf, and reared the larva to full growth.

27. The Checkered Tussock Moth, *Halisidota tessellaris*, S. & A. At Ottawa the basswood seems to be one of the favourite food plants of the caterpillars of this arctiid moth. When beating the foliage for larvae, this species has been one of the commonest we have collected, but the caterpillars have never been found in any great numbers, so the damage has not been very serious. The full grown larva is over an inch in length with a black head, the body covered with hairs of a delicate buff-yellow colour, and bears four dorsal blackish pencils, or conspicuous tufts, in front, two pairs of shorter lateral white tufts, and a pair of whitish tufts near the end of the body.

28. The Spotted Tussock Moth, *Halisidota maculata*, Harr. also has been frequently found on basswood at Ottawa. The caterpillar is larger, and quite different from the preceding species, the body being black, covered with tufts of bright yellow and black hairs, the black tufts being on the four anterior and three posterior segments, and the yellow tufts on the remaining segments. The latter are centred down the middle of the back with a row of black tufts.

29. The Hickory Tussock Moth, *Halisidota carye*, Harr. Caterpillars of this species have been found feeding on linden in July, August and early September. This larva has a black head and the body is clothed with dense tufts of white hairs, with a ridge of black hairs down the centre of the back, and two pairs of long black pencils on the first and seventh abdominal segments.

This and the above two species of *Halisidota* larvae become mature in the fall of the year and spin oblong-oval cocoons, composed of the hairs from the body interwoven with some silk. The moths appear the following June.

30. *Schizura ipomoea*, Dbl. Specimens of the larva of this interesting notodontian were rather common at Meech Lake, Que. the past season. On the 15th August Mr. C. H. Young and the writer collected a number of examples by beating the foliage of basswood; by the 22nd Sept. the specimens were full grown.

31. The Gypsy Moth, *Porthetria dispar*, L. In the State of Massachusetts this insect has been the cause of widespread destruction, and the most extensive experiments ever attempted in the science of applied entomology, amounting in cost to millions of dollars, have been carefully conducted by such eminent entomologists as Fernald, Forbush, and Kirkland. The caterpillar of this European insect has a wide range of food plants, among which is the basswood. Fortunately the insect does not occur in Canada, it being confined to Massachusetts, and portions of adjoining States. In an interesting paper by Mr. Kirkland entitled "The Shade-tree Insect Problem," 1901, the following paragraph on the life history of the Gypsy Moth appears: "The parent moth lays its eggs to the number of five hundred to one thousand, in a yellow, hairy covered mass, on tree trunks, fences, buildings, walls, etc. The eggs hatch early the following May, and the caterpillars swarm abroad in search of food. They devour both buds and leaves, and sometimes even attack the tender bark of the twigs. As soon as the foliage develops they give it their undivided attention, feeding chiefly by day. When about one-third grown their feeding habits change, and the insects seek shelter by day and feed almost entirely by night. The full grown caterpillar is sparingly covered with stout hairs, and has a double row of tubercles along the back. On the five anterior segments these tubercles are blue; on the six posterior, dark red. The caterpillars pupate in masses in any convenient sheltered locality, particularly at the bases of large branches, and in about a fortnight the moths emerge."

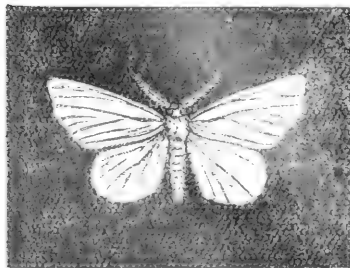


Fig. 16. Snow-white Linden Moth.

32. The Snow-white Linden Moth, *Ennomos subsignarius*, Hbn. (Fig. 16). The caterpillar of this geometrid moth has been recorded by different writers as destructive to the linden. Packard, in his *Insects Injurious to Forest and Shade Trees*, treats of it under the name of the Elm Span worm. Full grown, or nearly so, larvae have been frequently collected at Ottawa from basswood. When mature they are over an inch in length, of a brown colour, with a large head which is red, as is also the posterior segment of the body. The caterpillar reaches maturity in June, and the moths appear during July and early August.

33. The Bag-worm, *Thyridopteryx ephemeraformis*, Haw. (Fig. 17.) Although we have no actual record of its capture, or presence, this insect doubtless occurs in Canada. In some of the States adjoining the Dominion it has been very destructive to a great many kinds of fruit and shade trees, among which is recorded the linden. The habits of this insect are remarkable: The caterpillar, as its name suggests, makes a bag composed of twigs or bits of leaves, within which it lives. The female moth is wingless, and soon after emerging commences to fill the bag which she made when a larva with eggs. These bags containing the eggs hang on the trees all winter, the young caterpillars hatching the following spring.

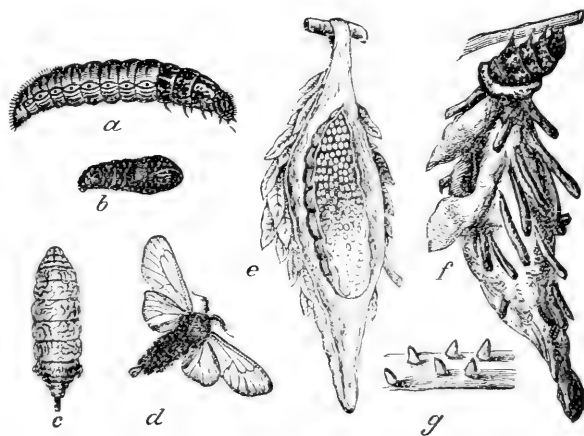


Fig. 17. The Bag-worm: a, caterpillar removed from the bag; b, male chrysalis; c, wingless and legless female moth; d, male moth; e, bag cut open showing female chrysalis and eggs; f, caterpillar in the bag; g, cones made by young larvae.

34. The Oblique-banded Leaf-roller, *Archips rosaceana*, Harr. The larvae of this common and widely distributed tortricine moth are very general feeders, and we have found them on a great variety of trees and shrubs at Ottawa, the basswood being among the number. During the past season they were particularly abundant on the apple, but did not do any serious damage.

35. *Paraphia subatomaria*, Wood. On the 14th April last a single larva of this insect with some apple leaves was received at the Division of Entomology from Mr. R. J. Messenger, of Bridgetown, N.S. This caterpillar would not, however, eat apple in confinement, and after almost everything else had been tried we succeeded in getting it to eat basswood, on which food we reared it to the perfect insect, the moth emerging on the 8th June.

36. *Paonias eccrucatus*, S. & A. On several occasions we have collected in August, at Ottawa, the larva of this hawk moth by beating the foliage.

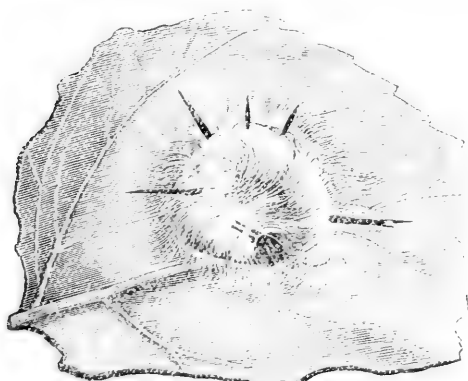


Fig. 18. *Apatela* caterpillar.

37. *Apatela Americana*, Harr. The caterpillars of this noctuid have also been beaten from basswood (Aug. 25) by the writer. The larvae feed on the foliage of a number of other trees (Fig. 18).

38. *Ania limbata*, Haworth. A single larva of this geometrid moth was found by Mr. Harrington feeding on the linden at Ottawa, and given to the writer, who bred it to the perfect insect.

39. *Coleophora tiliaefoliella*, Clem. In Packard's Forest Insects it is stated that the larva of this species feeds on the leaves of linden from the beginning to the latter part

of May. The larva is said to be dark, dull brown, the dorsal plates and head black. We have never collected the insect in Ontario.

40. *Lithocolletis luctiella*, Clem. The larvae of this beautiful little moth have been found quite commonly on the basswood in some districts.

41. *Lithocolletis tiliacella*, Chambers. This is another miner in the leaves. We have found the species rather plentiful at Ottawa some seasons. Regarding this and the preceding species, Mr. August Busck, of the Department of Agriculture, Washington, tells me, in correspondence, that these two small white and golden moths are much alike, to the uninitiated, in their adult stage, but can be easily recognized by anyone by their different mines. *Lucetiella* makes an inconspicuous small, white, tentiform mine between two ribs, on the underside of the leaf, while *tiliacella* makes a larger, showy, nearly circular white, brown-dotted blotchmine on the upper side of the leaf.

42. *Parorquia Clintonii*, G. & R. Specimens of the larva of this moth have been found feeding on basswood by Mr. C. H. Young, at Meech Lake, Que. The larvæ were full grown in July, and moths from collected material emerged the end of August.

43. *Heterocampa manteo*, Dbl. Full grown larvæ of this notodontian have also been found on the linden at Meech Lake, Que. by Mr. Young. Caterpillars collected the end of August produced moths the later half of the following June. Some of the larvæ gathered were parasitized by the large ichneumonid, *Ophion bilineatus*.

44. *Symmirista albifrons*, S. & A. The caterpillars of this moth have been recorded by Dr. Fletcher as having appeared in great numbers at Ottawa in 1884, being particularly injurious to oaks and maples. Larvæ about half grown were found feeding on basswood on the 15th August, near Ottawa, by the writer.

45. *Tortricidia testacea*, Pack. A larva of this species was found feeding on the foliage by Mr. Young, and another specimen by the writer, the moths emerging in June.

46. *Eulea querceti*, H.-S. Mr. Young tells me that larvæ of this pretty little moth were very common on basswood at Meech Lake, Que., the past season. Full grown caterpillars were collected in September. The moth appears in July, specimens having been collected on the 12th, 14th and 27th.

47. The Pyramidal Grape-vine Caterpillar, *Pyrophila pyramidoides*, Gn. A few examples of nearly full grown larvæ of this common insect, have been occasionally beaten from basswood, about the middle of June, at Ottawa. The caterpillar is frequently destructive to grape, but while partial to that plant, it also feeds on maple, plum, poplar, gooseberry, etc.

48. *Mellocampa praprandaria*, Gn. This species occurs throughout Canada, and in some districts is fairly abundant. We have found the larvæ on basswood at Ottawa, the moths emerging early in September. The imagos fly at Ottawa the latter half of June and again late in August.

49. *Cenopsis Pettitana*, Rob. On the 31st May, 1899, the writer collected the larva of this small tortricine moth on the foliage of basswood. The caterpillar changed to pupa on the 7th June, and the moth emerged on the 16th June.

Other lepidopterous insects which have been recorded as feeding on basswood, and all of which occur in Canada, are as follows:—

- | | |
|---|--|
| 50. <i>Papilio turnus</i> , L. | 58. <i>Basilona imperialis</i> , Dru. |
| 51. <i>Polygonia interrogationis</i> , Fab. | 59. <i>Panthea furcilla</i> , Pack. |
| 52. <i>Polygonia comma</i> , Harr. | 60. <i>Apatela hastulifera</i> , S. & A. |
| 53. <i>Basilarchia arthemis</i> , L. | 61. <i>Apatela morula</i> , Grt. |
| 54. <i>Eucanessa antiopa</i> , L. | 62. <i>Apatela luteicoma</i> , G. & R. |
| 55. <i>Ceratonia amynitor</i> , Ceyer. | 63. <i>Datana Angusii</i> , G. & R. |
| 56. <i>Phobetron pithecium</i> , S. & A. | 64. <i>Datana Drezellii</i> , Hy. Edw. |
| 57. <i>Samia cecropia</i> , L. | 65. <i>Lithacodes fasciola</i> , H.-S. |

During our study of the insects which feed upon the foliage, we have collected at least a dozen more species of lepidopterous larvæ which we have been unsuccessful in rearing to the imagos. The majority of these were small species.

Order HYMENOPTERA.

66. The Linden slug, *Selandria tiliae*, Nort, a common species on basswood, occurs throughout Ontario.

67. The Willow Sawfly, *Cimbex Americana*, Leach. This is a common species throughout Ontario, the larva always attracting attention when noticed. It feeds chiefly on willow and elm, but Harrington records it as feeding on linden at Ottawa. (Rep. Ent. Soc. XV. 65).

Order DIPTERA.

68. *Cecidomyia verrucicola*, O. S. This common gall gnat is recorded by Smith as occurring frequently at New Brunswick and elsewhere in the State of New Jersey, on the leaves of linden.

Order ACARINA.

Some of the Phytoptidæ, the family to which the well known Pear-leaf Blister-mite belongs, commonly called gall-mites produce galls of various sizes and shapes upon the leaves of the plants they infest.

69. The Linden gall-mite, *Phytoptus abnormis*, Garman. This species is recorded by H. Garman in Forbes's 1st Annual Report as producing galls on the leaves of American linden, at Bloomington, Ill.

70. The Clover mite, *Bryobia pratensis*, Garman. Eggs of the clover mite have been found at Ottawa on basswood, by Dr. Fletcher, but no injury has been recorded.

OCCURRING ON THE BARK.

The insects which occur on the bark are all homopterous species, and obtain their food by means of their beaks, through which they suck up the juices.

71. The Maple-tree Scale-insect, *Pulvinaria innumerabilis*, Rathvon. In Ontario this species has probably been the most abundant of those which occur on the bark. The maple is the tree upon which it is most frequently found, but it has an extensive range of food-plants, among which is the basswood. In the City of London, the past season this insect was very conspicuous, owing to the white cottony mass which surrounds the eggs. Dr. Bethune refers to this infestation in London in another part of this Report.

72. The Oyster-shell Bark-louse, *Lepidosaphes ulmi* L. = *Mytilaspis pomorum*, Bouche. This scale insect is particularly destructive to the apple tree, and is one of the commonest of the well known insect pests of the orchard. The species, however, has been found on linden as well as on a great many other trees and shrubs. An ordinary lime wash (1 lb fresh lime in 1 gallon of water) sprayed on to the trees in early winter, and again soon after the first application is thoroughly dry, has been found very effective at the Central Experimental Farm. This material flakes off the trees during the winter and takes with it large numbers of the scales. This treatment should be followed in the spring, when the young plant lice are hatching, with a spray of kerosene emulsion, whale oil soap, or tobacco and soap solution.

73. The San Jose Scale, *Aspidiotus perniciosus*, Comst. This the most deadly of all fruit insects also has a wide range of food plants, including the basswood. In Canada the insect is fortunately confined to certain areas in Ontario, but in those areas it has been the cause of terrible destruction to peach, apple, plum, and pear trees, and has been found in numbers on other trees and bushes adjacent to infested orchards.

74. The Putnam Scale, *Aspidiotus ancyclus*, Putn. This scale is also recorded as occurring on linden. In Canada the species has several food plants, and, while not abundant enough to be considered injurious, is not uncommon in Ontario.

75. The European Fruit Scale, *Aspidiotus ostreaeformis*, Curtis. This species also has a wide range of food plants, and among other trees has been found on the basswood. It occurs in several places in western Ontario.

76. *Pulvinaria tiliae*, King & Ckll. This species occurs in western Ontario, but is not a very common insect.

77. *Eulecanium tulipifera*, Cook. This insect is the same as *Lecanium tiliae*. It has been found occasionally on basswood at Ottawa, but not in any numbers.

BORING INTO THE WOOD.

The insects which bore into the wood of the linden belong chiefly to the Order Coleoptera, or beetles. They do not as a rule attack healthy trees; it is when these are weakened in some way that they are attacked by the grubs of boring beetles. The following borers are known to occur in the wood of the basswood.

ORDER COLEOPTERA.

78. The Linden Borer, *Saperda vestita*, Say. This is the most destructive borer of the basswood. It is a common species and has a wide distribution. The grubs are white, rather slender, and when mature slightly over an inch in length. The beetles emerge at Ottawa late in May and during the early part of June. On the 4th June 1902, we found mature larvæ, and also pupæ in a tree in the arboretum of the Central Experimental Farm, which had been killed by the attacks of this borer. Beetles which had just emerged were also collected.

79. The Flat-headed Apple-borer, *Chrysobothris femorata*, Fab. (Fig. 19.) Although the larva of this insect has been called the Flat-headed Apple-borer, it does not by any means confine its attacks to that tree. Larvæ have been found in linden as well as in many other orchard and forest trees. The species is common and widespread. The larvæ are pale yellow, flat-headed grubs. The eggs are laid by the female beetle in the cracks and crevices of the bark, and the young larva upon hatching eats its way through the bark and feeds on the sap-wood within. As it becomes mature it usually enters the solid wood, and when about to change to a pupa, bores its way back again to the outside but not quite through the bark. The female beetles in Canada resort to the trees for egg laying during the month of June, and at that time the trunks and larger branches of the trees to be protected should be painted with an alkaline wash. Dr. Fletcher recommends: soft soap reduced to the consistency of thick paint by the addition of a strong solution of washing soda in water. If applied with a brush on the morning of a warm day, this will dry in a few hours and form a tenacious coating not easily dissolved by rain. If one pint of crude carbolic acid be added to the gallon of wash it will make it more effective.

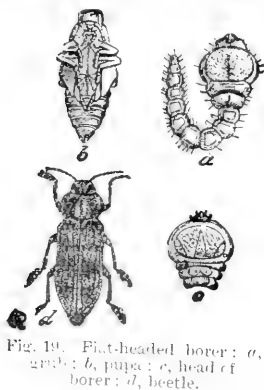


Fig. 19. Flat-headed borer: a, adult; b, pupa; c, head of borer; d, beetle.

80. The Sugar-maple Borer, *Plagionotus speciosus*, Say. (Fig. 20) The only reference we know of to this borer as a linden insect appears in *Country Gentleman* for August 8, 1895. In this issue Dr. Lintner spoke of injury to sugar maples and a linden tree as probably having been caused by the larva of this beetle. In his 1885 Report, Dr. Fletcher mentioned that he had received several specimens of this handsome wasp-like beetle, with the statement that it had done considerable damage to shade trees. It is not an uncommon species in Ontario, but we do not know of any instances of the larvæ having injured basswood in Canada.

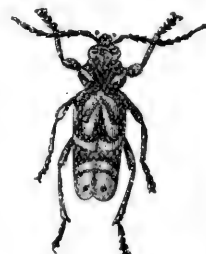


Fig. 20. Sugar-maple borer.

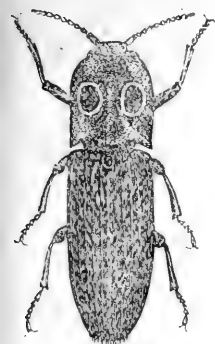


Fig. 21. *Alaus oculatus*.

81. *Alaus oculatus*, L. (Fig. 21.) This elater is found not uncommonly in many parts of the Dominion. It is a striking species. The larvæ feed in decaying wood.

82. *Melanotus communis*, Gyll. This common elater is recorded by Townsend as occurring "under the bark."

83. *Elater nigricollis*, Hbst. Mr. R. J. Crew, of Toronto, tells me that he has found specimens of this beetle in a dead basswood stump, Nov. 11, 1901.

84. *Parandra brunnea*, Fabr. Townsend records having found specimens of this insect under the loose bark of basswood. The larvæ breed in a variety of deciduous and coniferous trees.

85. *Prionus brevicornis*, Fabr. This handsome cerambycid is said to be a borer in the basswood.

86. *Neoclytus erythrocephalus*, Fabr. This beetle is mentioned in Dr. E. P. Felt's report as State Entomologist of New York for 1899, as having been observed ovipositing on a dying tree, *Tilia americana*.

87. *Cyrtophorus verrucosus*, Oliv. is recorded by some writers as living on linden as well as on the wood of some other trees. The species is common in Ontario.

88. *Hoplosia nubila*, Lec. In Packard's Forest Insects it is stated that "according to Le Conté this longicorn lives in the basswood." A specimen of this species was reared at Ottawa from boughs of basswood brought into the office during the winter of 1900. The full grown beetle, which is not unlike a diminutive specimen of *Anthophylax attenuatus*, Hald., emerged the following spring.

89. *Saperda tridentata*, Oliv., and

90. *Saperda lateralis*, Fab., are both stated by Lugger to "occur upon a variety of forest trees such as linden, poplar and others." Both these species are found in Canada.

91. *Xyletinus lugubris*, Lec. A single specimen of this small beetle was reared at Ottawa from a dead basswood branch brought into the office during the winter.

92. *Eupsalis minuta*, Dru. This is a species which bores under the bark of several different trees. Townsend records having found it in basswood, and the insect has also been collected at Ottawa.

93. *Stenoscelis brevis*, Boh. This insect has been included among those which have been found in the decaying wood. We have reared the species from dead boughs brought into the office in winter. Mr. Harrington has bred it from oak, hickory, maple and poplar.

ORDER LEPIDOPTERA.

94. The Leopard Moth, *Zeuzera pyrina*, L. This is an introduced insect which occurs destructively in some of the eastern cities and their immediate vicinity, in the United States, particularly New York and Jersey City. I do not know of any specimens having been found in Canada. This borer is a very general feeder, having been known to attack basswood, maple, elm, hickory and other trees.

INSECTS INJURIOUS TO ONTARIO CROPS IN 1903.

BY DR. JAMES FLETCHER, DOMINION ENTOMOLOGIST.

The season of 1903, like the preceding one, was of an unusual character throughout the Province. Up to the middle of June, an exceptional drought prevailed in most districts; this was followed by copious rains and a luxuriant growth of all vegetation till the end of the season. These conditions had a marked influence on the prevalence of insects injurious to crops. During the spring months Cutworms were troublesome in a few localities, but there was no complaint of widespread injury. Wireworms and White Grubs were mentioned in several places.

There was much enquiry for instructions on the best way to treat seed peas to destroy the Pea Weevil. This was a natural outcome of the vigorous campaign instituted by the members of our Society subsequent to the conference held at the last annual meeting. Seed merchants and farmers, I am convinced, did more in 1903 to control this pest than has been done previously for many years, and reports at the end of the season indicate a more satisfactory state of affairs as to the abundance of the Pea Weevil. In the Ontario crop report for October Prof. James gives the crop of peas for 1903 as 8,924,650 bushels, as against 7,664,679 for 1902 an increase of one million and a quarter bushels. As a result of the spring drought, all hay and fodder plants were slow in developing, and there was much injury on old meadows from "Silver-top," which was especially noticeable in fields of Timothy. This injury seems to be due to two causes,—the attacks of a minute insect, a member of the Thripidae, *Limothrip poaphagnus*, of Comstock, and various small leaf-hoppers and true bugs which puncture the stem and suck the sap from the lower part of the top joint, thus causing the head to wither and turn white before maturity. In addition to these and in a lesser degree, the stems of some of the larger grasses are occasionally attacked by the Wheat-stem Maggot (*Meromyza Americana* Fitch).

Some of the striking features of the year were the marked decrease in the injuries of the Hessian Fly, and in most places of the Tent Caterpillar and of the Squash Bug. The Codling Moth in the eastern part of the province gave very little trouble; and, west of Toronto, where there are two broods, the first brood was not nearly so injurious as usual; although later in the season the caterpillars appeared in some numbers, the apple and pear crops were freer than usual of this pest. This being the case, it is most important that fruit growers should now more than ever practise the joint remedy of spraying in the early spring and banding the tree in the autumn, not forgetting that examining these bands and destroying the contained larva is of even more importance than putting the bands on the trees. The enormous crop of plum this year made the attacks of the Plum Curculio for the most part insignificant. In some places however, the injury was extreme, and this was particularly the case where spraying had not been well attended to. The Fall Web-worm (*Hyphantria textor*, Harris) was noticeably on the increase, and the same may be said of the White-marked Tussock Moth [*Hemerocampa* (*Orgyia*) *leucostigma*, S. & A.]. It is most important that fruit growers and municipal bodies should attend to both of these insects without further delay. The Birch Skeletonizer (*Bucculatrix* (*Canadensisella*), Cham.) appeared again in some numbers in Central Ontario, but was not nearly such a serious pest as it has been for the past two years, nor were its injuries this year augmented to any serious extent by the work of a large aphid (*Callipterus mucidus*, Fitch) and a leaf hopper (*Empoasca smaragula*, Fall.) which last year were very abundant. Attacked trees, this year, held many of their leaves till the end of the autumn. Experiments in spraying trees with whale-oil soap wash containing Paris green were successful, and this is probably the best remedy to apply on ornamental trees, should the insect again increase abnormally. The Horn Fly which some years ago did such serious injury among dairy herds has this year been decidedly

more troublesome than has been the case for several years, and it is worth recording that I found it in several places in British Columbia, even on Vancouver Island. It has therefore now spread right across the continent. The remedy which has given the best results in my experience, is smearing the animals lightly on such parts as are most attacked, with a dressing of one pound of pine tar in five pounds of lard. Up to the present year the application we have used has only been of half this strength, viz.: 1 lb. of tar in 10 lbs. of lard, but decidedly better results have been secured by using the stronger mixture.

CEREAL CROPS.

Cereal crops throughout the Province were little injured by insects during 1903. The only insect which drew particular attention from farmers was the Grain Aphis (*Nectarophora granaria*, Kirby), and, notwithstanding that this plant-louse was reported from a great many localities during the month of August, little real harm was done to the crop. The usual parasites, *Aphidius* and various *Syrphus* flies, quickly appeared and destroyed the infesting plant-lice. The Pea Weevil, as already stated, was not so abundant as usual in most places; but, owing to the large number of farmers who have given up the cultivation of this important cereal, it is rather difficult to decide as to the actual amount of harm done. The acreage this year put in to peas was much less than for many years, but the average yield per acre was higher. Prof. Lochhead tells me that in certain districts the weevils were very numerous and that, in localities in the southwest of Ontario where many peas are still grown, one of his correspondents in the County of Kent reported that about one half of the peas contained weevils in the larval and pupal state at the end of August, and that the insect was still abundant and destructive in the Counties of Dufferin and Halton.

The Hessian Fly was decidedly less destructive in all parts of the Province, and there were only one or two instances reported where it had done noticeable harm. This is, of course, to a certain extent due to the increase of its natural parasites; but, undoubtedly, farmers throughout the districts where fall wheat is grown, are now systematically sowing later than formerly, that is, they are waiting until after the middle of September instead of trying to get in their seed in by the first of the month.

An injury to oats which caused some loss and was the subject of considerable enquiry was the blighting of the lower flowers in the panicles of late oats. The florets turned white and no grain was produced. This was due, it is believed, to the attacks of a *Thrips* (Fig. 22) and agrees very closely with the injury done by two species of *Thrips* which attack small grains in Europe. Prof. Lindeman, who has studied these small insects and has published an important article on those living on cereals in Russia, thinks that "only two species are of agricultural importance. *Thrips secalina* (possibly *Limothrips cerealium*, Halid.) occurs on the ears of rye in June and then, later, in the second brood, on summer wheat and barley. The injury of this species, however, is less than that of *Phleothrips frumentaria*, Bd. This caused great damage by puncturing the ovaries of rye, wheat, barley and timothy." The insects hibernate in the adult form, and this suggests the possibility of controlling them by deep fall-ploughing and the burning over of stubbles. This injury occurred not only in Ontario but eastward into the Province of Quebec and was reported as far west as Manitoba.

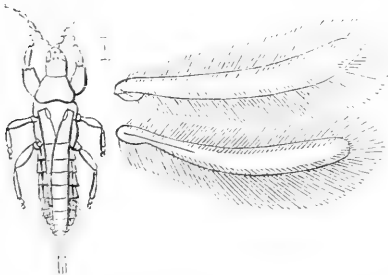


Fig. 22. A *Thrips* and its wings, greatly magnified.

FODDER CROPS.

(Owing to the exceptional drought of early spring all grass crops were very much delayed in development, and there was until the middle of June every appearance of a serious shortage

At that time, the whole country and all vegetation was as dry and burnt up, even the foliage of forest trees, as in a dry September in ordinary years. On the 11th June in the Ottawa district, however, regular rains began, and at the end of the season hay crops were almost up to the average, and pastures in excellent condition. Peas grown for fodder, either alone or in mixed crops, were somewhat injured in the western part of the Province by the Pea Aphis (Fig. 23). This was most noticed on the Grass Pea and Field Peas which were held back from maturing by the cool damp summer.

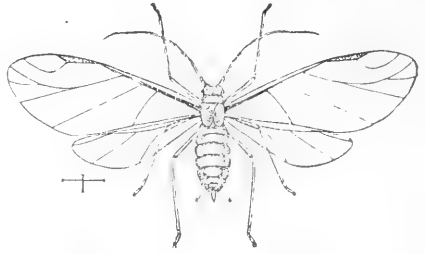


Fig. 23.—Pea Aphis, greatly magnified.

The Clover-seed Midge (*Cecidomyia leguminicola*, Lintn.) was the most destructive enemy of fodder crops this year and occurred pretty well throughout the Province. Where clover was grown for seed, except in Simcoe county and northern localities, very little was reaped, and, even where the clover was grown for hay, the heads were distorted and poorly developed. Those growers who followed the recommendations which have been made, reaped far better crops than those who were less provident. The remedies consist of feeding off with stock, or cutting and drawing from the field the first crop of clover, before the 20th of June, which is the time when the larvæ of the first brood mature and leave the clover heads to enter the ground and complete their changes. The perfect insects which lay the eggs for the second brood, appear just as the second crop of clover is coming into flower, when they lay their eggs amongst the forming blossoms; the small red maggots then penetrate the pod and destroy the seed. Just before the time for the seed to ripen, these leave the clover and enter the ground, where they pass the winter to emerge again the following June as tiny gnats, which lay their eggs in the clover heads before the flowers open. By the feeding off or cutting of the first crop of clover, the whole of the first brood of larvæ in a field is destroyed before they leave the heads, and the second crop from which the seed is reaped, is comparatively free of attack. At the present time, co-operation among growers in adopting this well tried method is a manifest necessity, if there is any hope of growing clover seed for the market in those districts best suited to its production.

White Grubs, the larvæ of various species of May Beetles (Fig. 24.), did some damage in fields of fodder corn and in hay meadows, and two reports were received of serious injury to lawns, where the grubs occurred in such numbers that the sod could be rolled up like a carpet, the whole of the roots having been eaten away. In the case of meadows and field crops, little can be done at the time the insects are noticed; but, on lawns, if the injury has not gone too far, copious waterings with kerosene emulsion are effective. As a rule, in a short time the grass will recover; but it is always advisable to help it with some more seed and a light top-dressing of nitrate of soda, used in the proportion of 1 pound to the square rod, that is about 160 pounds to the acre. If the lawn is small, the most convenient way to apply the nitrate of soda is to dissolve it in water, 1 pound in 5 gallons, and apply it with a

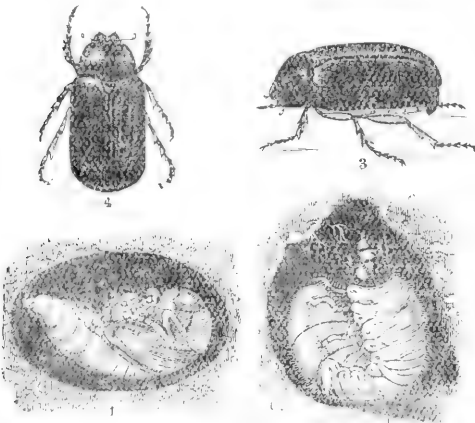


Fig. 24.—White Grubs: 1, pupa; 2, larva; 3 and 4, beetles.

watering-pot, but the same proportion of the salt to the space must be preserved, viz. 1 pound to the square rod.

ROOT CROPS.

Roots in most places were an excellent crop throughout the province, but there were various injuries from insects. The Cabbage or Radish Maggot (*Anthomyia radicum*, Bouché) did much injury to turnips as well as to cabbages and cauliflowers in gardens. It was, however, irregular in its occurrence, doing much harm in one place, while in another very close to it, it hardly appeared at all. The Onion Maggot (*Phorbia ceparum*, Meigen) appeared in the same irregular manner but was the cause of more loss, some fields of onions being entirely destroyed. We have still to find a satisfactory remedy for these troublesome root maggots. In the case of the Cabbage Maggot when attacking cabbages or cauliflowers, the best remedy is undoubtedly the application of the disks of tarred paper recommended by Prof. Slingerland. We have now used them at the Central Experimental Farm for several years and always with great satisfaction. Where these have not been put on early, a remedy which may be used is to pour a small quantity of a strong decoction of pyrethrum insect powder (4 ozs. to the gallon of water) around the root of each plant after drawing away the earth right down to the root-lets; the earth must then be put back again. Half a teacupful will be sufficient for each plant. For onions and radishes, dusting white hellebore along the rows, as soon as the young plants appear, has given good results when the insects are not abnormally abundant. Kerosene emulsion has also been used by some people with satisfaction. For garden radishes, undoubtedly the best application is Prof. Cook's Carbolic Wash, made by adding one quart of soft soap (or one pound of hard soap) to a gallon of water; heat to the boiling point, and then add half a pint of crude carbolic acid. When required for use, take one part of this mixture to fifty of water and sprinkle directly upon the growing plants once a week from the time they appear above the ground. The chief trouble in the case of root maggots is that gardeners trust too much to chance that the plants will not be attacked; but, as a matter of fact, in every part of Ontario it must be expected that cabbages, radishes and onions will be attacked, and, unless preventive measures are adopted, there will be considerable loss every year.

Some experiments undertaken by Mr. W. T. Macoun, the Horticulturist of the Central Experimental Farm, during the past summer with the object of producing early tobacco and vegetables of high quality, have an important entomological bearing, which is well worthy of mention here. An enclosure was made with a light frame work of wood six feet in height and covered entirely on the top and along the sides with cheese cloth. In this tent tobacco and various kinds of vegetables were sown or planted, and a similar duplicate plot was also planted just outside, with the same conditions of soil and soil moisture. The rows of this plot were practically in continuation of the rows within the enclosure. The experiment was very satisfactory as far as forcing all the plants grown to earlier maturity; but the important observation was made by Mr. Macoun that this cheap protection prevented entirely the attacks of many kinds of injurious insects. Radishes, onions, cabbages and cauliflowers were absolutely free from root maggots. Nothing was attacked by the troublesome Tarnished Plant-bug (*Lygus pratensis*, L.), or the Four-lined Leaf-bug (*Pæcilocapsus lineatus*, Fab.), and cucurbits of all kinds were entirely free from injury by the Striped Cucumber Beetle. In fact, this experiment has furnished us with a sure means of growing many vegetables of which, from the difficulty of getting them in perfect condition, gardeners had in some places given up the cultivation. This is particularly the case with cauliflowers, cabbages, radishes and onions, and other plants of only moderate height, which could be entirely protected by a frame-work only three feet high and three feet wide for single rows. With such a covering it would be impossible to cultivate between the rows; but the cost of building an enclosure in which a man could work with ease and where several hundreds of plants could be grown, is so little, that paying results

can certainly be obtained with many kinds of plants. Careful handling in taking down and storing away the cheese cloth and framework would ensure the lasting of these for at least two or three years. Such enclosures are manifestly unsuitable for the cultivation of plants like egg-plants and cucurbits, which need the intervention of insects for the fertilization of the flowers.

The Carrot Rust-fly (*Psila rosea*, Fab.) is merely an intermittent enemy of the carrot in Ontario. It occasionally appears and does a considerable amount of injury, particularly to red carrots. In the Maritime Provinces, where it seems to find conditions better suited to its development and where these are certainly more like those in its European home, the Carrot Rust-fly is a regularly occurring enemy of the carrot. During the past summer I was surprised to find at Ottawa the same insect attacking the roots of Celeriac, or Turnip-rooted Celery. Dr. E. P. Felt, State Entomologist of New York, also records a similar injury to celery in his report for 1902. The galleries in the roots of the celery are marked with the same bright rusty red colour which is noticeable on carrots. Strange to say, this year carrots grown in a bed almost adjoining the Celeriac showed no trace of injury; but it should be stated that these carrots were sown very late in the season, not until July, which may have had some bearing on the case; for it has been noticed by several growers that, when carrots are sown late, the injury is much less, even in districts where the Rust-fly is abundant. This insect passes the winter in the puparium, which is formed in the earth around the roots, or in the sand in which they are stored for winter. The adult flies emerge the following spring and lay their eggs at the roots of young carrots, frequently, as was observed by Miss Ormerod, creeping down beneath the surface wherever any crevices occur. The first appearance of attack is on the outside of the young roots, and more often towards the tip than higher up. At the same time some of the leaves of the carrot turn purple, which is also an indication of injury, and such plants should be pulled out as soon as noticed. When carrots are harvested at the end of the season, the injuries by the maggots are frequently inconspicuous, although the root may be honey-combed in every direction as will be seen when it is cut for cooking. When carrots are grown for table use, they are rendered worthless on account of the discolored tunnels which traverse the root in every direction. The remedies for this insect are sowing in new ground, sowing late, and the protection of growing plants with deterrent applications, such as kerosene emulsion, one part to ten of water, or a carbolic wash, such as the Cook wash mentioned above under Radish Maggot, to be sprayed along the rows immediately after hoeing or thinning out; or the dusting of sand, land plaster, or ashes, which have been saturated with kerosene at the rate of half a pint to three gallons, may be practised instead. The liquid washes, however, are rather better, because they wash soil around the roots again, and fill up all crevices which may have been made when thinning out, and into which the females might creep to lay their eggs. When carrots or celery have been stored in earth or sand, this should be carefully buried in a deep hole, so that the flies on hatching may be prevented from getting out.

Owing to the wet autumn, injuries from Slugs and Millepedes have been more frequent than usual. These are not insects, but advice concerning them is usually asked from entomologists. For Slugs light top-dressings of salt or fresh lime at short intervals are very useful. For Millepedes applications of nitrate of soda have proved effective—at the same time this salt is an exceedingly valuable and quick-acting fertilizer for all vegetation.

The Asparagus Beetles (*Crioceris asparagi*, L., and *C. 12-punctata*, L.) have continued to do some damage in the Niagara district and have also evidently increased their area of infestation. In last year's report Mr. Moffat recorded the 12-spotted Asparagus Beetle as having occurred abundantly at London, Ont. During the past summer the common Asparagus Beetle (Fig. 25) was found much further east than it has been found before. Mr. J. Macnamara sent in specimens from Bracondale, close to Toronto; so, there is a probability, as asparagus is

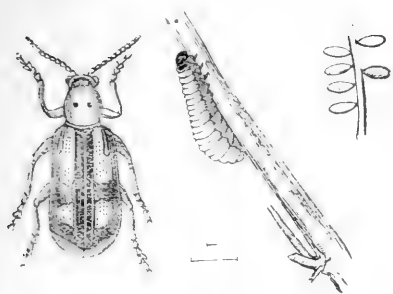


Fig. 25.—Asparagus Beetle, larva and eggs.

only kills the larvae by coming in contact with their bodies, but destroys both the larvae and the perfect beetles when they eat the poisoned foliage. (3) Beating the beetles and larvae from the asparagus plants into beating nets or open pans containing water with a little coal oil on the surface, is an effective remedy. A good pattern for an easily made net, which can be held beneath the plants with one hand while the insects are beaten down on to it by striking the plant with a light rod, has a stick on each side and a flat sheet of cotton between, three feet wide at the top and one foot at the bottom. Two cross bars close together at the base allow of this net being easily held by taking the upper bar in the left hand so that the lower bar rests against the back of the wrist. Figure 26 appeared in the "Canadian Entomologist" many years ago and shows a most convenient beating net which I have used a great deal. The viscid larvae are easily brushed from the plant with a stick, and it is claimed that, if this is done in the middle of a hot day, few of them will get back again on to the plants, as a very short time in the hot sun proves fatal to them. Chickens and ducks will eat these insects with avidity, and if the plants are beaten, they will soon learn to pick them up as they fall.

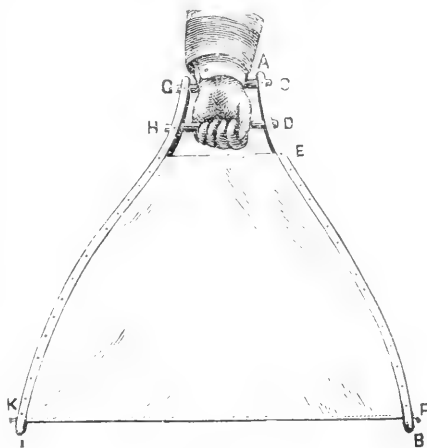


Fig. 26.—Beating net.

The Striped Cucumber Beetle (*Diabrotica vittata*, Fab.), Fig. 27, has, as usual, done some harm to squashes of all kinds, cucumbers and melon plants. As soon as the young plants appear above the ground, they are attacked by the beetles which have wintered over in the adult state. A perfect remedy for these troublesome insects is still wanted. When they do not appear in very large numbers, there are many partial remedies which are worthy of trial. Among these, the sifting of dry ashes or land plaster and Paris green (1 to 50) over the vines, is the best application and must be applied early in the season as soon as the insects appear. Hardwood ashes alone are useful, but the additional poison does far better work. A remedy which is largely adopted by the large cucumber and melon growers of the United States, consists of covering the vines with a piece of gauze cheese cloth, large enough to cover the hill easily, and supported by two or three sticks stuck into the ground, the edges of the cloth to be held down by putting a little earth on them. By the time that the plants are large enough to require the removal of the cloth, the first brood of the beetles will be passing away.



Fig. 27.

The Cabbage Aphis (*Aphis brassicae*, L.) was only referred to occasionally in Ontario correspondence; however, the insect was the cause of considerable loss both in British Columbia and Prince Edward Island upon cabbages and turnips. When cabbages in gardens are attacked,

the aphid may be controlled by spraying with whale-oil soap. In turnip fields, where the greatest amount of injury is done, a sharp lookout must be kept at the time of thinning for any infested plants, which must then be hoed out and destroyed.

FRUIT CROPS.

The fruit crops of the province were on the whole satisfactory and remunerative to most growers. The plum crop was enormous in all districts and comparatively free from injury by insects. Fungous diseases were more destructive by far than insect enemies. Peaches in western Ontario were a full crop. Grapes in western counties were very seriously affected by the Black Rot. Apples were a large crop and the fruit was of excellent quality. In the eastern part of the province they were free from injuries of all kinds, but in western Ontario they were somewhat injured by the Black Spot of the apple (*Fusicladium*) and late in the season to some extent by Codling Moth. The pear crop is reported as good, but the ravages of the Pear-tree Slug (*Eriocampa cerasi*, Peck) were serious in some places. A few reports were received of injuries by the Pear-tree Psylla (*Psylla pyricola*, Foerster); but the injury by this insect has not been as great as at one time was anticipated. Nevertheless, in some localities, serious damage has been done. Prof. Lochhead tells me of one such occurrence in the Grimsby district, where a whole orchard was found to be infested in July and serious harm done to the trees. There is no doubt that this insect is widely spread throughout the Dominion; this year I have received specimens from two places in the province of Nova Scotia. The effects upon infested trees are a dwarfed and stunted growth and a dirty appearance of the trees caused by the growth of the Sooty Fungus (*Fumago salicina*) upon the copious honey-dew which is emitted by these flea-lice in large quantities. When trees are badly attacked, it takes them several years to overcome the injury, and many trees are actually killed outright. The best treatment for trees which are known to be infested, is to spray the trunks during the winter with coal oil emulsion or some other wash to destroy the hibernating insects. As winter approaches, the perfect flea-lice, which in shape very much resemble a minute *Cicada*, creep beneath the scales of the rough bark upon pear trees and remain there until the following spring, when they emerge in the warm days of April and lay their eggs upon the young wood. A remedy which has been highly spoken of, is one which has been used by Mr. Henry Lutz, of Youngstown, New York State. In 1896 a large Duchess orchard belonging to him was almost ruined by Pear-tree Psylla. In February, 1897, the whole orchard was thoroughly sprayed with a whitewash, and two years afterwards this orchard was almost free from the Psylla. Mr. Lutz explains his plan as follows: "During the cold weather in December we spread a canvas under the trees and then scrape off all the rough bark; this dislodges many of the torpid insects, which are burnt with the scrapings. We then give the trees a thorough coating of slushy whitewash, made of freshly slaked lime which has been run off in a putty state, as masons usually make it for plastering. We thin this with skimmed milk, and put it on to the trunks of the trees with a brush; for those parts of the tree which we cannot reach, we thin down the whitewash with more milk and then give the whole tree a thorough spraying. In this way we destroy a large number of the hibernating Psyllas, and those which are not killed, are so well sealed up that they cannot get out to lay their eggs. We spray again in March to coat the wood and buds, so that the few that are alive can find no favorable places to lay their eggs. The orchard where we experimented contained a thousand trees which were practically worthless; but, since we began using the lime, it has steadily regained its vigor." Trees sprayed in spring with lime-sulphur-and-salt wash were found by Mr. Joseph Tweddle, of Stoney Creek, to be quite cleared of the eggs of this insect.

The Apple Aphid (*Aphis mali*, Fab.) was reported from several localities, and it was claimed that it had done much injury; but all of these reports were made at the time the insects were swarming on the trees, and in all cases they soon disappeared. The worst injury which I have noticed from the Apple Aphid, was to young trees in nurseries and to the young green apple

which, in some varieties more than in others, were much distorted and disfigured, so as to give very much the appearance of apples which had been stung by the small British Columbian Apple Fruit Miner (*Argyresthia conjugella*, Z.). Wherever the fruit is punctured, growth ceases, and, with the subsequent increase in the size of the fruit, these places remain as pits or depressions, rendering the fruit unsightly and unfit for the market. This injury, however, is not a common one, but it points to the advisability of spraying trees for the Apple Aphis, should the fruit, when forming, be found to be badly infested. Injury by the Apple Aphis, in Ontario at any rate, is very seldom serious enough to bearing trees to make the expense of spraying for that insect alone advisable. On nursery stock for bulding it must be attended to when abundant, or injury will be done. Should this be necessary at any time, the best remedy is to spray the trees thoroughly with whale-oil potash soap, using one pound to six gallons of water. The addition of a pound or two of home grown tobacco to a barrel of mixture is beneficial but is not actually necessary, because the green-colored plant-lice, such as the Apple Aphis, are more easily killed than the black varieties, as the Black Cherry and Peach Aphides.

The Plum Aphis (*Aphis prunifolii*, Fitch) appeared early in the season, and it was thought it would do much harm, but suddenly there was so great a diminution in the numbers of the insects from the increase in their natural parasites, that practically no loss resulted. The same state of affairs also prevailed in Western Ontario with the Black Cherry Aphis.

The Oyster-shell Bark-louse (*Mytilaspis ulmi*, L.) is still one of the worst enemies of the apple grower in all parts of the Dominion, and is particularly destructive in the eastern part of our province. In the south-west it seems to be kept in check to a large extent by the minute chalcid parasite, *Aphelinus mytilaspidis*, LeBaron. The presence of this parasite in a colony of the scales can be detected by the minute round holes left by the flies in the top of the old scales, from which the parasites have eaten their way out. This little parasite does good work in all parts of the Dominion from the Atlantic to the Pacific; but, strange to say, notwithstanding the enormous abundance of the scale, it is very intermittent in its appearance. In the Maritime Provinces the Oyster-shell Bark-louse is to a certain extent kept in check by a parasitic fungus similar to that which destroys the San José Scale in Florida. The remedies for the Oyster-shell Bark-louse have been frequently given; they consist of high cultivation of infested trees and spraying in winter with lime wash, followed in summer with kerosene emulsion. Where trees have been treated with the lime-sulphur-and-salt wash they have been thoroughly cleaned of this scale.

The San José Scale (*Aspidiotus perniciosus*, Comst.)—I regret to say that the San José Scale situation is very little better to-day than it was a year ago. The insect, although it has not spread widely beyond the limits already recorded, has most decidedly increased in individual orchards and is doing an enormous amount of harm. The Federal Government fumigation Stations have watched most jealously every shrub and tree which has been imported that was in the least likely to bring into the country fresh importations of the scale; and it is but just to state that, up to the present time, not a single instance has been found of new infestation from stock brought into the country or of a live scale upon any tree which has been fumigated. Many of our fruit growers, recognizing the importance of remedial treatment, have sprayed their trees with remedies which have been recommended and have obtained paying results. The remedies which have been used to the greatest extent, are those which were recommended at the San José Scale conference held at the annual meeting of the Entomological Society of Ontario in 1901, viz. whale-oil soap, petroleum, and fumigation, or the lime-sulphur-and-salt wash; these have been recommended by Mr. Geo. E. Fisher as Inspector of San José Scale. Quite recently experiments have been made with a carbolic wash made by Mr. G. A. McBain, of St. Catharines, and also with a lime and sulphur wash in which the sulphur was combined with the lime by means of caustic potash. Both of these remedies are claimed to have given good results, and many have tried the former during the

past summer in western Canada. There is no doubt that the lime-sulphur-and salt wash will clear trees of the scale to the extent of allowing them to retain their vigour and bear paying crops of fruit. The same may be expected confidently from the newer but similar lime-sulphur-and-potash wash which is much more easily made; and, if the McBain Carbolic Wash can be procured at a price equal to that of these washes and will kill the scale as effectually, it will certainly become a very popular wash, owing to a very important characteristic, the ease with which it can be diluted with water at the time it is required for spraying. Such experiments as I have been able to examine, showed that a large proportion of the scales were killed with one application, but not enough to free the trees from the danger of thorough reinfestation before the end of the season. I am told, however, that these same trees have been again treated and that they are now practically, although not entirely, free from scale. We have then several practical remedies by which this disastrous enemy can be controlled, if fruit growers will use them. It is of the greatest importance that everyone who understands the gravity of the case should endeavor to stir up those who are less informed, to greater effort in fighting this pest, which is costing the country so much every year in actual money for fumigation and inspection, and also, just as surely, in reduced crops and in the destruction of valuable fruit trees and nursery stock. People in the infested districts are getting used to the idea of the presence of the San José Scale, and, having become familiar with it, are, I fear, doing less to control it. It is, however, all the time becoming worse and worse; the injury is increasing, and, what is of the greatest importance, this need not be the case, if all concerned would make greater efforts to control the insect and prevent it from spreading in their own orchards and from their own trees to those of their neighbors.

A green Apple Sawfly (*Taenios nigrisoma*, Nort.).—Prof. Lochhead referred at the last annual meeting to a green sawfly larva which had been found several times in apples. This is that of the above named sawfly, which usually feeds on plants of the Dock family. Attention having been drawn to it, it has been noticed in many different localities, and it would appear as if this habit of eating into apples to pass the winter is more frequent than was at first supposed. I cannot hear of anyone having observed the larvæ feeding on any part of the apple tree, nor do I anticipate that this will ever develop into a serious pest. All plants of the Smartweed or Dock family should be destroyed when they occur in orchards, so that there may be nothing to attract the egg-laying females.

The Plum-leaf Sawfly (*Dimorphopteryx pinguis*, Nort.).—European plums at Ottawa this autumn were noticeably attacked by the curious larva of this sawfly, leaves of plum trees during August and September being very much riddled, and in many cases almost totally devoured by the larvæ. These when full grown are about three-quarters of an inch in length, and lie exposed on the surface of the leaves, sometimes as many as three or four on a leaf. They have a peculiar habit, when at rest, of lying with the body curved in the shape of an open S. The general color above is olive green, with two wide black stripes down the sides. The head is bright chestnut red beneath and black above; close behind the head are three fleshy white prominences, two in front and one close behind it. The anal flap has a transverse row of four of these which are black, and the previous segment bears two more anterior to these. The infrastigmatal fold is edged with a row of white-tipped tubercles, giving a somewhat fringed appearance to the larva as it lies on the leaf. The larvæ late in the autumn burrow a short distance into the soil, where they form tough cocoons, from which the flies emerge the following spring. These sawflies are about the size of the common Currant Sawfly, but have the thorax dark brownish black with a conspicuous light central point; the abdomen is chestnut red darkened at the tip. The head is black and square, the antennae are thick and red, the legs red, darkened at the joints. The perfect sawflies appear in June and July, and the larvæ are found on the trees as early as August and late into September. I have also once found the larvæ feeding on the Norway Maple and perhaps on Bass-wood.

There were no important outbreaks of small-fruit pests brought to my notice during the past season. The usual pests which occur every year, as the Currant Sawfly, Currant Looper, Currant Aphis, White Grubs in strawberry beds, Cutworms, Raspberry Cane-borer, and Raspberry Sawfly, and a few grape pests were reported; but little injury was done, and remedies are known for all of these.

OBSERVATIONS UPON THE FOOD-HABITS OF HYMENOPTEROUS LARVÆ.

BY REV. THOMAS W. FYLES, LEVIS, QUE.

Nature has its tragedies: of such, entomology supplies numerous and startling examples. Over-sensitive people may shudder at the thought of them, and be inclined to wonder that the Beneficent Being, who originated and over-rules the forces of nature, should allow occasion and place for them. But what would become of humanity if such creatures as the Hessian Fly, the Army Worm, and the Potato Beetle were allowed to increase without a check? Is the thought of mankind, and innumerable classes of inferior animals, perishing miserably of starvation less appalling than the consideration of nature's methods of keeping down destructive pests? Human agency is often called in for the suppression of insect devourers; but can we say that the means of man's using, the burning, the crushing, the poisoning by Paris Green, etc., are as far-reaching, as effective, as merciful, as those which nature uses to the same end?

It may be asked, Why are such destructive vegetarians as those you have mentioned allowed a place in the economy of nature? Doubtless to clear the districts they affect of exclusive growths, that other plants may be preserved and perpetuated. Where destructive insects intrude upon the fields of human industry, human reason and ingenuity are called into play for their suppression; and man is glad to perceive that he has numberless allies working for the same end.

The fact is that the equilibrium in nature is maintained by a system of checks and counter-checks; and the more we examine this system, the more our admiration is excited by it.

It is not my purpose to enter upon a systematic investigation of the Hymenoptera; time and space are not at my disposal for such an investigation. I shall confine my attention to a brief consideration of the modes in which the larvæ of these creatures assail their victims.

I find then that parasitic and predaceous Hymenopterous larvæ may be classed thus:—

A. Those that assail their victims *from without*.

1. Those that suck the juices of their victims.
2. Those that devour their prey bodily.

B. Those that carry on their deadly work *within* their victims.

1. Those that leave their hosts to undergo their after changes.
2. Those that enter upon the pupal stage within their hosts.



Fig. 28. Larva of Geometrid (original).

A.—1. Some years ago I found a yellow larva of a Geometrid which presented a strange appearance. (Fig. 28). It had, seemingly, on the upper surface of its middle segments, a bunch of bluish green follicles, which it carried about as Christian carried his bundle of sins; but, unlike Christian, it never in life was freed from its burden. The seeming follicles were larvæ pressed closely together, and distended with food. Each of them had its nozzle inserted in the back of the poor caterpillar, and was draining its life-juices. The victim succumbed in a few days; and then its assailants spread over its underside, and, after

draining what nutriment they could find there, spun their cocoons and went into the pupal stage. In due time the flies appeared. I am indebted to that prince of Hymenopterists, Dr. W. H. Ashmead, of Washington, for the identification of the species—it is *Euplectrus frontalis*, Howard.

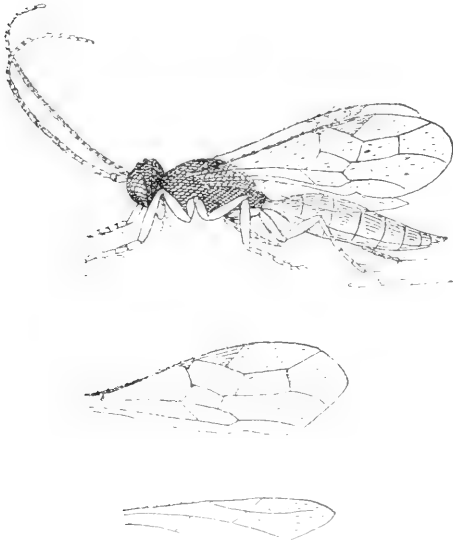


Fig. 29. *Bracon furtivus*, greatly magnified, (original).

and the flies from them appear in the spring of the following year.

Notice the form of these sucking larvæ (Fig. 30).

The caterpillars of the beautiful Gelechian of the White Aster live in hollow galls, in the stems of that plant—one caterpillar in a gall. A small Braconid, Fig. 29, — (*Bracon furtivus*, Fyles) detects the hermit in his dwelling, inserts her ovipositor and drops a few eggs into the chamber. These eggs soon hatch ; and the little larvæ that come from them (Fig. 30)



Fig. 30. *Bracon furtivus* larva, greatly magnified, (original).

attach themselves to the caterpillar and exhaust its life's juices. They spin their cocoons within the gall ;



Fig. 31. *Trypoxys tuniculorubra*, greatly magnified, (original).

A.—2. The same Gelechian has another foe of a larger build (*Trychosis tunicula-rubra*, Fyles) Fig. 31, which intrudes a solitary egg into the gall. From the egg comes a larva with a good-sized mouth, the upper lip of which has a beak-like formation for cutting and tearing, (Fig. 32). This larva assails the rightful inhabitant of the gall and *devours* it. I have found it making its last meal of the fragments of the chrysalis, (Fig 33).

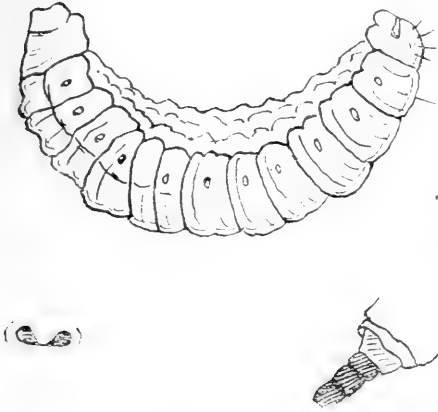


Fig. 32. Larva of *T. tunicula-rubra*, mouth and terminal segment, greatly magnified, (original).

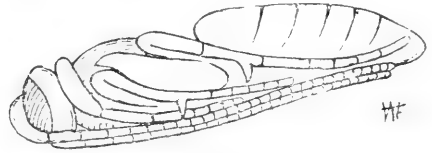


Fig. 33. Chrysalis of *T. tunicula-rubra*, greatly magnified, (original).

B.—1. In our walks in the fall and winter we sometimes notice under the cross-bars of fences and in other sheltered spots a fluffy white or yellowish ball, that looks like a wad of cotton batting. On examination we find that it is made up of delicate cocoons. The larvæ which spun these cocoons lived inside a forest tent-caterpillar (or one of some other species) till it ceased to feed. Then they broke through the skin, and "spun up" over the remains of their host. They belong to the species *Apanteles longicornis*, Prov. I have a mass of such cocoons before me, and the flies that came from it—they number 95. What a brood of larvæ an unfortunate caterpillar must have carried within it! How rapid under favorable circumstances must be the increase of this *Apanteles*!

B.—2. At St. Joseph, about a mile from Levis, there is, beside the Intercolonial Railway, a bold escarpment of great height, which forms a conspicuous object in the view from Quebec. It is crowned with a tangled growth of shrubbery. Its summit is the only spot in the neighbourhood, that I know of, in which the scented Lady's Slipper, (*Cypripedium parviflorum*, Salisb.) is to be found. Last year while digging up some roots of this, I unearthed a climbing cut-worm, that evidently had been feeding upon the leaves of the plant. I took the caterpillar home, and it went into chrysalis; but from the chrysalis came—not a moth as I had expected, but—a fine active specimen of *Ichneumon lotus*, Brullé. The creature had undergone its changes within the body of its host.

Examples might be multiplied of insects belonging to the several classes above mentioned. Numbers of such insects are of economical importance, as attacking the depredators upon various growing crops. Enough however has been said to show that a vast army of minute assistants are working in favour of the husbandman; and that, as regards the different modes of their operations, *good* is undoubtedly the *final goal* of (seeming) *ill*.

A KEY TO THE INSECTS AFFECTING THE SMALL FRUITS.

BY PROF. W. LOCHHEAD, OF THE ONTARIO AGRICULTURAL COLLEGE.

BRAMBLE INSECTS.

A. Attacking the Roots and Base of Canes.

1. Large grub over 2 inches long, boring large tunnels in the woody portions of main root. The canes suddenly die.

Giant Root-Borer (*Prionus laticollis*), Fig. 34.

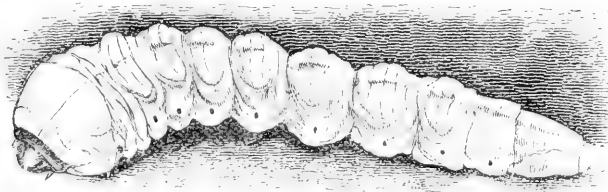


Fig. 34. *Prionus laticollis* grub.

2. Canes at base of main root girdled by a yellowish white caterpillar, in late summer and autumn.

Bramble-crown Borer (*Bembecia marginata*).

B. Attacking the Canes :

1. Longitudinal row of punctures on canes.

Snowy Tree-Cricket (*Ecanthus niveus*), Fig. 35.

2. Tips of raspberry canes wilting in early summer, due to a girdling of the canes inside the bark.

Raspberry-Cane Maggot (*Pnoria* sp.).

3. Tips of shoots of raspberry wilting ; two rows of punctures one inch apart at base of wilted portion, with a small hole between. Canes are burrowed to the base before autumn.

Raspberry Cane-Borer (*Oberea bimaculata*).



Fig. 35. Tree-Cricket.

4. Swellings on canes of raspberry and blackberry.

Red-necked Cane-Borer (*Agrilus ruficollis*), Fig. 36.

C. Injuring the Buds :

1. A small snout-beetle, puncturing the flower-stem close to the buds, and also the buds.

Strawberry Weevil (*Anthonomus signatus*).

2. A small yellowish beetle eating the flower-buds, which fail to open, or wither.

Pale Brown Byturus (*Byturus unicolor*).

3. A small brownish caterpillar eating the opening buds.

Bud Moth (*Tinetocera ocellana*), Fig. 37.

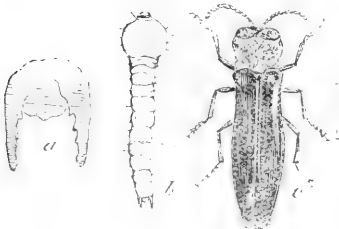


Fig. 36. Red-necked Cane-borer : *b*, grub ; *a*, horns at anal extremity ; *c*, beetle—all magnified.

D. Attacking the Leaves :

1. Insects sucking the sap of young growing parts, and arresting their development.

Tarnished Plant Bug (*Lygus pratensis*).



Fig. 37. Bud-moth and larva.



Fig. 38. Raspberry Saw-fly: Larva on leaf: segments magnified to show arrangement of spines.

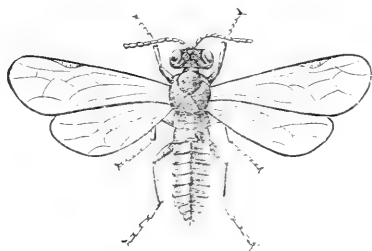


Fig. 39. Raspberry Saw-fly.

2. Suckers and leaves curl up with enclosed lice.
Bramble Flea-Louse (*Trioza tripunctata*).
3. Small larva eating the leaves, in spring.
Raspberry Saw-Fly (*Monophadnus rubi*), Figs. 38 and 39.

E. *Attacking the Fruit:*

1. A looper feeding on fruit of raspberry and black-berry.

Raspberry Geometer (*Synchlora glaucoria*),
Fig. 40.

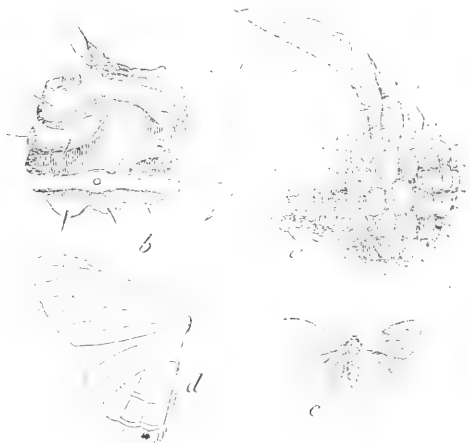


Fig. 40. Raspberry Geometer: *a*, larva, natural size, on fruit; *b*, segment, magnified, showing hairs, etc.; *c*, moth, natural size; *d*, pair of wings enlarged—color pale green.

A. *Attacking the Canes:*

1. Tips of canes girdled and wilted; pith tunneled.

Current Stem-Girdler (*Janus integer*).

2. Centre of canes tunneled by a white caterpillar.

Imported Current-Borer (*Sesia tipuliformis*), Fig. 41.



Fig. 41. Clear-winged moth of Current-borer.



Fig. 42. Current Worms.



Fig. 43. Current Saw-fly: leaf showing eggs and holes eaten by the young larva.

3. Small, flat, circular scales, black or gray, with a depressed ring about a central nipple in black forms.

San Jose Scale (*Aspidiotus perniciosus*).

4. Oval, hemispherical scales.

Currant Lecanium (*Lecanium ribis*).B. *Attacking the Leaves* :

1. Larvæ, 20-legged, dull white when young, then greenish with black spots, finally greenish-yellow, eating holes in the leaves in early spring.

Imported Currant Worm (*Nematus ribesii*), Figs. 42 and 43.

2. Leaves curled, blistered, and with a reddish appearance on upper surface, caused by yellowish plant lice.

Currant Plant-Louse (*Myzus ribis*).

3. Leaves turning brown and dying.

Four-Lined Leaf-Bug (*Poecilopsus lineatus*).

4. Measuring worm feeding on leaves of gooseberry and black currant.

Currant Span-Worm (*Diastictis ribearia*), Figs. 44 and 45.

5. White spots on leaves, produced by a pale green sucking insect occurring on the under surface.

Currant-Leaf Hopper (*Empoa albopicta*).C. *Attacking the Fruit* :

1. Greyish caterpillar boring into young fruit, and eating out its contents.

Gooseberry Fruit Worm (*Zophodia grossulariæ*).

Fig. 44. Currant Span-worms; 3, the chrysalis.

2. Purplish spots surrounding small circular scales.

San Jose Scale (*Aspidiotus perniciosus*).

3. Yellow oval maggots, eating the Gooseberry.

Gooseberry Midge (*Cecidomyia grossulariæ*).

4. Small white grub eating the currant and gooseberry, causing the fruit to turn red and fall.

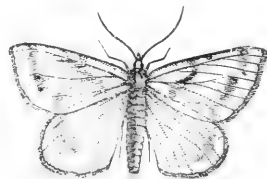
Currant Fly (*Epochra Canadensis*).

Fig. 45. Currant Span-worm Moth (pale yellow with dusky spots).

GRAPE INSECTS.

A. *Attacking the roots* :

1. Producing little irregular spherical galls on rootlets and larger roots, causing death.

Grape Vine Phylloxera (*Phylloxera vastatrix*), Fig 46.

2. Large borer, cutting a tube through the root near the surface.

Broad-necked Prionus (*Prionus laticollis*.)

3. Grub eating the bark of both the large and small roots.

Grape-vine Fidia (*Fidia viticida*.)B. *Attacking the Branches* :

1. Young shoots suddenly break off or

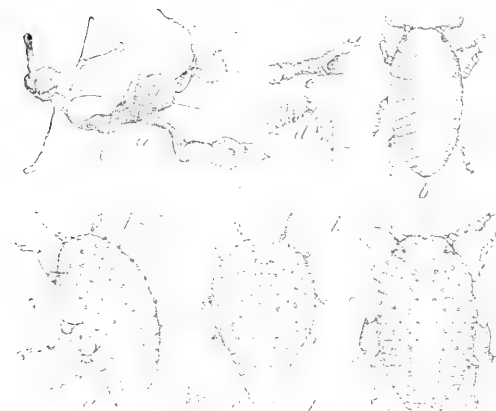


Fig. 46. Grape-vine Phylloxera. — a galls on rootlets; b young louse; c, f, g, more matured lice; e, antenna; d, leg.

droop in spring ; a small hole just above the base of the shoot leads into a burrow.



Fig. 47. Apple Twig-borer, the beetle.

in the bark.

Apple Twig-Borer (*Amphicerus bicaudatus*), Figs. 47 and 48.

2. Canes show roughened longitudinal rows of perforations

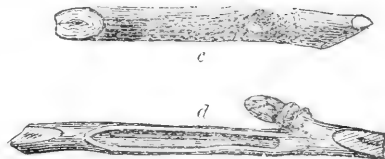


Fig. 48. Apple Twig borer, c hole made by borer, d burrow.

Snowy Tree-Cricket (*Ecanthus niveus*).

3. Canes exhibiting white cottony masses attached to a reddish brown scale.

Cottony Scale (*Pulvinaria innumerabilis*.)

4. Canes exhibiting white frothy masses which resemble spittle.

Spittle Insect (*Aphrophora*, sp.)

C. Attacking the Leaves :

1. Leaves riddled with irregular holes about midsummer, by a little beetle.

Grape-Vine Fidia (*Fidia viticida*), Fig. 49.

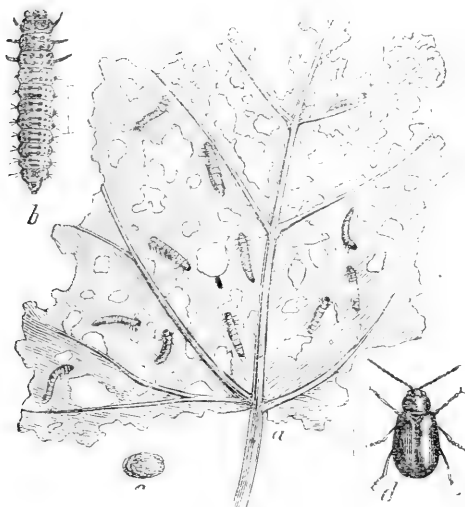


Fig. 50. Grape-vine Flea beetle and larvæ.

2. Boring into buds in spring, also eating small holes in expanding leaves, small shining blue beetle.

Grape-Vine Flea-Beetle (*Haltica chalybea*), Fig. 50.

3. Long legged, brownish beetles eating the blossom, leaves and fruit.

Rose-Chafer (*Macrodactylus subspinosus*).

4. Greenish caterpillar, feeding within a folded leaf and skeletonizing it, about midsummer.

Grape Leaf-Folder (*Desmia maculatus*), Fig. 51.

5. Leaves blotched and scorched, finally curling up and falling, by little jumping insects.

Grape Thrips or Leaf Hopper (*Typhlocyba vitifex*.)

6. Large greenish caterpillar, with a pale yellow strip down each side, and a horn near tail.

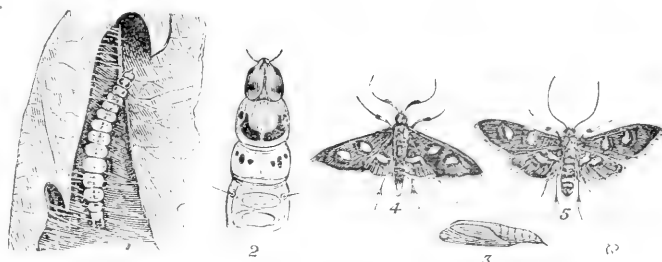


Fig. 51. Grape Leaf-Folder; 1 caterpillar in fold of leaf; 2 Head much enlarged; 3 chrysalis; 4 and 5 the moths.

Grape-Vine Sphinx (*Darapsa myron*), Fig. 52.



Fig. 52. Grape-vine Sphinx caterpillar.



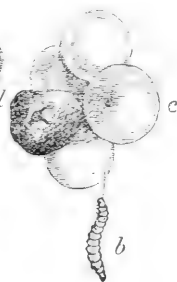
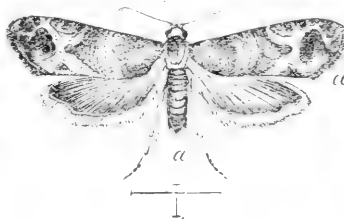
Fig. 53. Trumpet Grape-Gall.

7. Several other sphingid larvæ feed on the leaves of the Grape.
8. Black beetle eating the tissues on the upper surfaces of the leaves, and discoloring them.
Red Headed Systema (*Systema frontalis*).
9. Producing reddish, elongated, conical galls on the leaves.
Trumpet Grape-Gall (*Vitis viticola*), Fig. 53.
10. Large reddish yellow beetle with six black spots on wing-cover eating holes in leaves.
Spotted Pelidnota (*Pelidnota punctata*), see Fig. 7.

D. Attacking the Fruit :

1. Ripening fruit discolored, and burrowed by a whitish caterpillar.

Grape-berry Moth (*Eudemis botrana*), Fig. 54.



2. Eating holes in ripe fruit, beetle large, yellowish, hairy.

Bumble - flower

Beetle (*Euphoria*), Fig. 54. The Grape-berry moth ; *a* much magnified ; *b* full-grown larva ; *c* spot where larva entered ; *d* injured berry.



Fig. 55.
Bumble-flower
beetle.

- 3 Eating holes in young fruit, a long legged beetle.

Rose-Chafer (*Macrodactylus subspinosus*).

STRAWBERRY INSECTS.

A. Attacking the Roots :

1. A pinkish caterpillar boring irregular channels through the crown and larger roots, causing them to wither and die.

Strawberry Root-Borer (*Anarsia lineatella*).

2. A white grub boring downwards from the crown.

Strawberry Crown-Borer (*Tyloderma fragariae*), Fig. 56.

3. A large white grub eating the roots.

May Beetle (*Lachnosterna fusca*).



Fig. 56. Strawberry Crown-Borer: *a* the grub, *b* side view and *c* back of the beetle.

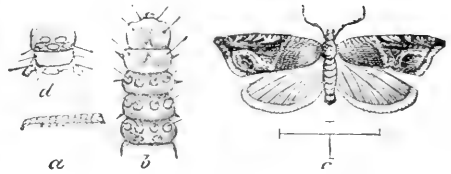


Fig. 57. Strawberry Leaf-roller: *a* natural size; *b* anterior and *d* posterior parts of body, much magnified; *c* moth, magnified.

B. Attacking the Leaves:

1. Brownish caterpillars in June and August rolling the leaves into cases, and fastening them with silk.

Strawberry Leaf-Roller (*Phoxopteria fragariae*), Fig. 57.

2. Young plants gnawed off at the surface.

Cutworms.

3. Small, pale spotted, active beetles riddle the leaves with holes in June.

Spotted Paria (*Paria 6-notata*).

4. A small, active, jumping striped beetle eating holes in the leaves.

Striped Flea-Beele (*Phyllotreta vittata*), Fig. 58.

5. 20-legged grubs eating holes in the leaves.

Strawberry Saw-Fly (*Emphytus maculatus*), Fig. 59.

C. Attacking the Fruit:

1. A caterpillar feeding on the berry.

Stalk-borer (*Gortyna nitela*).

2. A minute black bug, producing a "buggy" odor when eaten with berry.

Flea-like Negro-bug (*Corimelena pulicaria*).

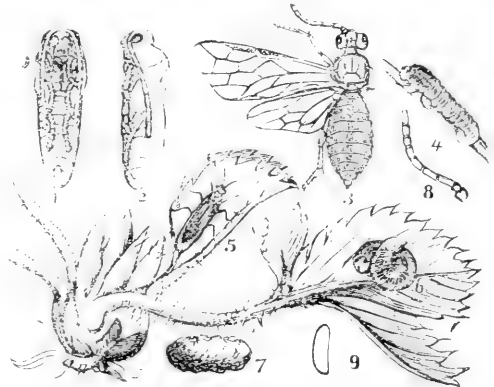


Fig. 59. Strawberry Saw-fly in all its stages.

COLLECTING AT LIGHT IN MANITOBA.

BY A. J. DENNIS, BEULAH, MAN.

☞ The opening of the season of 1902 was not very good with regard to collecting, although I took a few specimens of moths from sallow bloom, such as *Orthosia lutosa*, *Agrotis ypsilon*, *Taenioctampa rufula*, and a few others that I do not yet know the names of; nor have the early spring butterflies been at all common for the past two seasons. In some years I have seen *Erebia discoidalis* and *episodesa*, *Chionobas alberta* and *varuna*, *Lycena rustica*, *lygdamas* and *scipiolus*, very thick upon the prairie, but for some reason during the last two seasons they have almost failed me.

There was, however, one night last summer which I wish most particularly to mention as it may interest some of my fellow collectors. It was the greatest evening for collecting I ever had and a time that will never be forgotten. During the spring and early summer, I had been living on what is called "the Hooper plains," on light land, and such land is not good for collecting, not having enough vegetation. To explain what I mean by light land is that open prairie can be seen for miles around, the grass very thin and never green for more than six weeks or two months, with a few plants, but not enough to support a large amount of insect life. It is, however, just the place for *Chionobas alberta*, *C. varuna* and *Lycena rustica*. But to revert to the 11th of June, for that is the date I wish to mention.

I left the plains in the afternoon to go to the heavy land, or what is called "the bluffs." Before starting, I packed up my collecting outfit, consisting of a large sheet, a good strong stable lantern, killing bottles and my net. Through forgetfulness I left my chloroform behind—a mistake which I afterwards regretted, as it caused me to lose a large number of specimens which I should otherwise have taken. The day had been somewhat close, heavy black clouds passed overhead, and it looked very much like an impending storm. Towards evening, rain began to fall and lightning could be seen in the distance. I had a few things to do when I reached my destination, and before they were finished numbers of insects could be seen on the wing, especially fire-flies, which were very thick, and mosquitoes, which were thicker,—to use an old saying, "as thick as hairs on a cat"! After a time, I noticed the moths on the move, and that was a warning, which made me look round for a quiet corner where I could hang my sheet. Within a few feet from the stable, I found two aspens about the same distance apart as the width of my sheet. That is the place for me, I thought, and I at once proceeded to clear with my axe the lower limbs and any other scrub which might impede my movements. After getting the sheet in position, I had to arrange a pole to hang my lantern on; this being finished, I was ready for action. It was then about half-past eight o'clock. To make myself comfortable, I brought out a chair and put on a macintosh as it was drizzling with rain; then sitting down, I was ready to capture anything that came near.

Very soon a little white Geometer began to arrive, then others, and soon after nine o'clock the Noctuids made their appearance. I caught a few, such as *Hadena modica*, *H. arctica*, *Mamestra rosea*, *imbrifera*, *trifolii*, *meditata* and *purpurissata*, *Xylina signosa*, several species of *Chorizagrotis* which all seemed to be different, *Peridroma astricta*, etc. I also took specimens of *Spilosoma virginica*, *Ichthyura* var., *strigosa* and *albosigma*, *Nadata gibbosa*, *Lophopteryx elegans*—one a beauty, *Pheosia rimosa*, *Cerura cinereoides*, and many others whose names I hope to give at some future time.

Between half-past nine and ten, the Hawk-moths began to show up. First a single one, then a pair, and very soon a dozen were bobbing about. Some flew straight to the sheet and

remained there until I took them off, while others kept flying around the lantern pole. This was rather a drawback as it dazzled my eyes, trying to jump from one side to the other. Soon matters became very lively—Hawk-moths in all directions, and it kept me busy taking them from the sheet. I counted at one time about a score of *Smerinthus geminatus* on the sheet besides numbers that were buzzing about in the grass and darting around the lantern; later on in the evening there must have been fifty in sight at once. I was now kept busy all the time till at last it was not safe to put any more in my bottles, so I went into the house and waited for a while until I thought my captures were all dead. Then I emptied them into a small box and went out after some more. To my surprise they were as thick as ever—some on the sheet, others flying into the grass, then up again, around the pole, across to the shed, back once more, striking the lantern, then down into the grass. It did not take me long to refill my bottles and I then stopped, well satisfied with my evening's work. If anyone had begun to collect when I left off, he might easily have caught a hundred Sphinges, besides Noctuids and Geometers without number. Now was the time that the chloroform was missed, for if I had not forgotten it, I should have put in another hour, as it was such great fun and only twelve o'clock.

When I returned to the house, the first thing I did was to look at my captures and I was surprised to find some of them moving, so I put them all into the bottles until the morning. One great mistake was made in not capturing all the *Smerinthus geminatus*, for by not doing so I lost a good many fine *S. cerysii*. Not knowing how to distinguish them, I thought them all *geminatus*, therefore I did not bother about them as *Sphinx albescens* was to me more desirable. *Cerysii* must have escaped me very often, as I was not aware that it was taken in Manitoba, and it came to me as a surprise when Mr. Frank of the American Entomological Co. informed me that I had sent him *cerysii* under the name of *geminatus*.

It is very strange that only five species of Hawk-moths turned up that evening, viz., *S. albescens*, *Paonias myops* and *excrucatus*, *S. geminatus* and *cerysii*, considering that I have found twenty-five distinct species of the larvæ. These I have fed and reared as far as the pupa state, but then there came a full stop, for I can never get them any further. There is something in my treatment that does not suit them and which I do not yet understand, for I have good success with all other kinds that I rear.

FLY-TORMENTORS OF NEW ONTARIO.

By TENNYSON D. JARVIS, B. S. A., DEMONSTRATOR IN BIOLOGY AT THE ONTARIO AGRICULTURAL COLLEGE.

On the 15th of June of the current year, in company with Mr. G. F. Kay and H. J. Davis, I left Sudbury on an exploration trip through Northern Ontario. We proceeded by way of C. P. R. to Metagama and thence almost due north by canoe and portage to Night Hawk Lake, a distance of some 200 miles. After spending about six weeks in the region between Nighthawk Lake and the Lower Abitibi we returned by Blanche Rivèr and Lake Temiscamingue to the Upper Ottawa, and thus back to civilization, (See map, Fig. 60.)

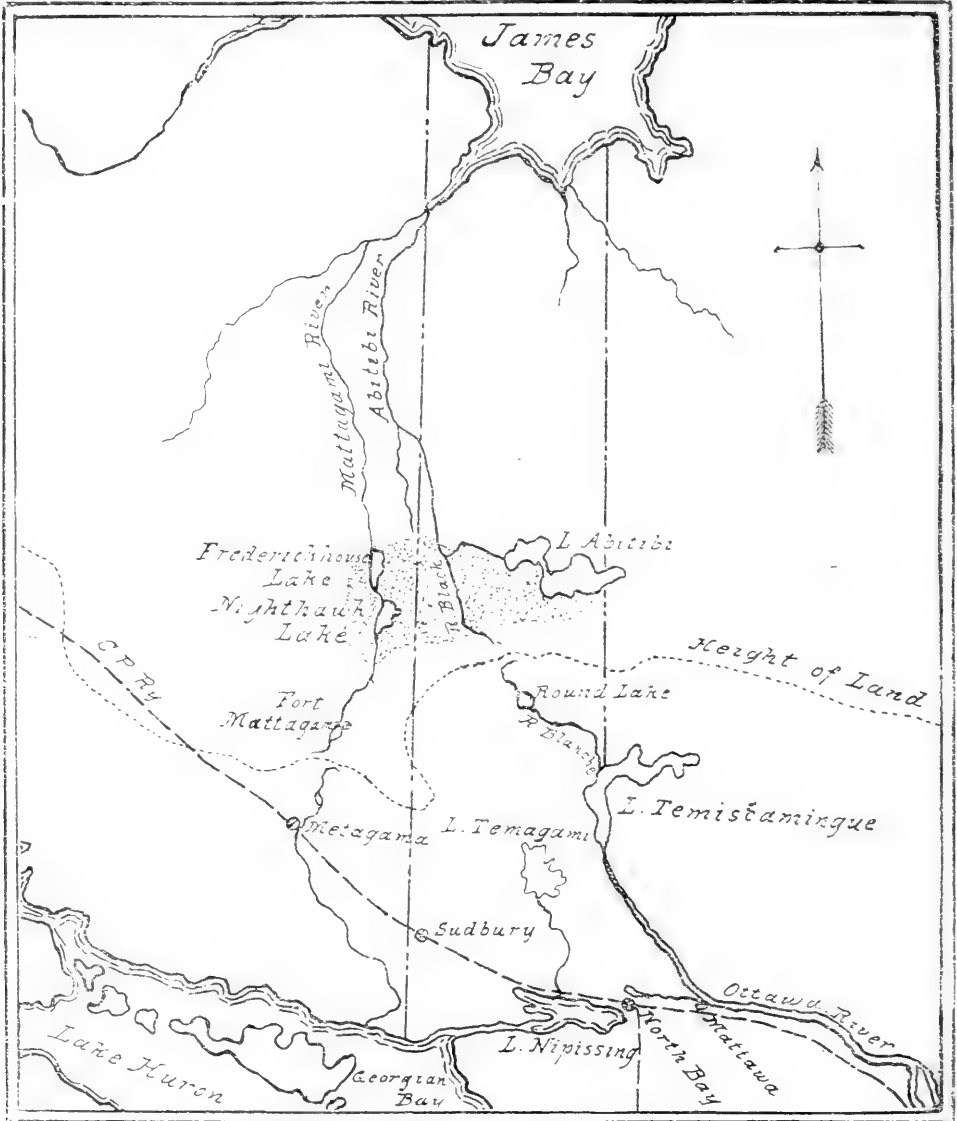


Fig. 60. Map of Northern Ontario.

Throughout the whole trip we were constantly pestered by flies of various species, and I shall endeavour in this paper to convey some idea of the habits of these fly-tormentors, and our experience with them.

MOSQUITOES.

The level wooded country of the Abitibi region abounds in swamps, marshes and muskegs, which form ideal breeding places for mosquitoes, and mosquitoes are there in millions. They proved to be the most troublesome pests which we encountered during our trip. The proverbial busy bee which labors all day long is not to be compared with them. They are busy—exceedingly busy—24 hours a day. They began to be very annoying soon after we took to our canoes at Metagama and from that time until we reached Mattawa on our return there was no respite. It would be practically impossible to convey an adequate idea of the suffering which we were obliged to undergo from their attacks, and no application of oil or salve to our hands and faces seemed to have any effect in keeping them off.

Each night after pitching our tent and banking it around with earth to keep the mosquitoes from entering at the bottom we started a smudge to drive out those within. Then after entering and carefully closing the tent, we burned insect powder which seemed to stupify them and drive them to the walls, where we scorched numbers of them with candles. We then betook ourselves to our blankets and to sleep, only to awake within an hour to find them as numerous as ever, and as hungry. After a few nights' experience we learned that a smudge only caused them to settle on the ground among the grass and moss, where they remained until the smoke escaped, and then began their ravages again. On making this discovery we tried driving them out by using coats or other clothing as batons, and we found this more effectual.

On one occasion my powers of endurance were severely tested when I undertook to make bread while the other members of the party were out of camp. When I got both hands into the dough the mosquitoes took advantage of the opportunity and pounced upon my defenceless head. At another time we were obliged to spend a night among the islands on Nighthawk Lake. We pitched our tent and made preparations for the night, but after vain attempts to sleep we were forced to paddle to another island in search of a place where the mosquitoes were not so numerous. After travelling from island to island for some hours we finally landed on a very small island of bare rock, where the wind had a free sweep. Here we spent the remainder of the night in comparative peace. We repeatedly observed that the mosquitoes were not so troublesome when there was a breeze blowing. Although they were very annoying at all times they were probably most active on cloudy days and at a temperature ranging from 45° to 70° F. They were more numerous on land than on water, but we were always accompanied by a swarm even when far from shore. They appear early in June and continue until September frosts.

I was surprised that we did not occasionally meet with Indians in the woods. On inquiry I learned that they never hunt during the summer months when flies and mosquitoes are out, but congregate at the forts where they can protect themselves to some extent from the insects by building smudges, thus keeping the atmosphere constantly laden with smoke. Even the dogs have learned to creep close to the smudges for protection. If the Indians, who have inhabited these regions for ages, find it impossible to go abroad during fly season, imagine what we poor unacclimatized pale-faces must have suffered. Sometimes the mosquito bites were positively agonizing. One day when some distance from camp we wished to cook some fish for dinner. We had but a single match and while I was trying to light the fire with this a mosquito bite caused me such insupportable pain that I dropped the match, and we were obliged to content ourselves with a cold meal.

It was part of my duty to make careful notes of my observations of animals, insects, plants, and soils as we travelled. I found this a most difficult task as the mosquitoes were such a constant annoyance. Let it be remembered that while the hands and face were the special points of attack, the mosquitoes did not limit themselves to these exposed parts, but would

even insert their probosces through our thick duck trousers and suck the blood to their hearts' content.

BLACK FLIES.

Next in importance to the mosquitoes may be mentioned the Black Flies, (*Simulium*). These are small black insects about one eighth of an inch in length with stout bodies and bulging thoraxes. The mouth parts are very curious, and Prof. J. B. Smith has ascertained that the females, which alone suck blood possess, besides the usual sucking organs, genuine biting mandibles. Unlike the mosquitoes they breed in rapidly flowing water. Although the bite of these flies is not poisonous it is very severe, drawing blood freely. I frequently noticed the faces of my companions streaked with blood, the result of fly bites. We experienced the greatest discomfort from these flies on bright warm days, and between 9.00 a.m. and 9.00 p.m. They did not bother us much during the hours of darkness but seemed to congregate on the walls of the tent in search of light. They were not attracted by lamp light. While the bites of the black flies were very painful, we also suffered from their getting into our nostrils, our ears, and under our eyelids. We also experienced much inconvenience by their congregating in large numbers in soup, gravy, and other articles of diet. This vexed our jovial half-breed cook so much that he once remarked that he would not mind cooking for us if he could only board somewhere else himself.

At one time the back of my neck was so much lacerated by fly bites that it became stiff and swollen, and I was unable to turn my head for several days. Heavy applications of carbolic salve to the face and hands seemed to prevent the attacks of these flies to some extent. I observed that they were troublesome not only to man but also to the dogs, deer, and other animals, and that they were more active in June and July than later in the season.

SAND FLIES.

Sand Flies, (*Ceratopogon*). These flies are very small yellowish insects, with transparent whitish colored wings having somewhat darker spots. I found great difficulty in capturing specimens as it was impossible to handle them without crushing them. By placing a green leaf on the back of my hand and by allowing them to crawl on it, I succeeded in securing a number, by folding the leaf and inserting it into a cyanide bottle.

The bites of these insignificant looking insects are very poisonous, causing much swelling and a painful burning sensation. Though the sand-flies look insignificant they never allow one to be ignorant of their presence day or night. They adhere very closely to the skin; they crawl up under shirt sleeves and trouser legs, and keep the whole surface of the body in a constant state of irritation. Unlike the Black-Flies they are attracted by lamp light or fire light, and are therefore very troublesome around the camp fire. We found them always most numerous in the vicinity of rapids or water-falls. They are active throughout the summer, but most troublesome during the latter part of July and August.

Deer Flies (Chrysops). Are large flies about half an inch in length. We found them very numerous in July and experienced much discomfort from their attacks. The bite is not poisonous but causes a sharp severe pain. They are not troublesome excepting on clear, hot days. These flies attack deer and moose as well as man.

Bull dog Tabanus (*Tabanus affinis*). This was the largest of the fly-tormentors of the north. The Bull-dog Tabanus, like the Deer fly, was only troublesome on clear, hot days in June and July. I shall never forget the first bite I received from this fly; the pain was so sudden and intense that I thought my end had come. One hot, clear day I counted as many as twenty-seven of these large pests attacking one of my companions.

In conclusion let me say that, although the various species of flies above described are exceedingly troublesome at the present time, it is altogether probable that as the country becomes cleared and drained and the soil cultivated, they will largely disappear and life will then be as tolerable in this region as in the older part of the province.

ENTOMOLOGICAL RECORD, 1903.

BY DR. JAMES FLETCHER, Ottawa.

The collecting season of 1903 was in most parts of Canada cool and disappointing; but, as is usually the case, persevering collectors made many interesting captures.

Judging from correspondence, the publication of the *Entomological Record* has had a most stimulating effect upon the study of entomology in Canada. Collectors can now learn the names and addresses of all the leading local collectors and students of the different orders of insects. The publication of records of captures of rare species, or those which have occurred either beyond their known range or at unusual seasons of the year, has also given much valuable information concerning the geographical distribution and life histories of many species. From exact information of this nature, some important collecting expeditions have been made by specialists, which have aided much toward the accurate working up of our Canadian insect fauna. Our collectors have also benefited much from being brought into correspondence with leading authorities outside our borders.

A great many notes of captures have been sent in—some of these, it is true, rather late in the year to be made the best use of, because in certain cases, records required confirmation before publication. A few correspondents considerably sent in their lists month by month, which has been a great assistance to the compiler, who here expresses his gratitude, making special mention of Messrs. Taylor, Harvey, Heath, Hanham, Criddle and McIntosh. It is much easier to make full use of these lists than of those which come in at the end of the season and are then, as a rule, hurriedly made up with few data. The exact locality and date are essential, and when, besides, notes are added as to the food plant or habitat, the record is very much increased in value.

A constant effort has been made to credit each collector with the capture of any species recorded—not only for his own sake, but so that anyone interested in a particular species may know to whom he can write for further information.

As anticipated in the last issue, there has been a great increase in the amount of special work done in Canada in 1903.

It is again my pleasing duty to gratefully acknowledge the invaluable help which has been given Canadian collectors in all parts of the Dominion by the leading American and Canadian specialists of the various orders of insects. No words can overstate the obligation we are under to such men as Dr. J.B. Smith, of New Brunswick, N. J.; Dr. L.O. Howard, the U.S. Entomologist, Dr. Harrison G. Dyar, Mr. D. W. Coquillett and Dr. W. H. Ashmead, of Washington; also to Dr. Henry Skinner, of Philadelphia; Mr. E. P. Vanduzee, of Buffalo; Prof. H. F. Wickham, of Iowa City, Iowa, and Mr. W. H. Harrington of Ottawa, Ont. These gentlemen have, in the most patient and generous manner, examined and named thousands of specimens for struggling collectors, who, without their help, might,—as so very many before them have done,—have given up the study of insects altogether, because, having no one to tell them anything about their captures, they first became discouraged and then lost all interest in the subject.

I again take the liberty of reminding my colleagues of the great importance, when sending insects to specialists for identification, of always submitting a good series of specimens for examination, when possible, and, further, that every effort should be made to provide such a friend with any specimens which he may indicate as desirable. In exchanging, a cardinal principle is that generosity is a policy of equal value with honesty.

There is a continued and satisfactory increase in the attention which is being given to the study of insects in our public schools, and naturally this has been fostered by the different members of the Entomological Society in their own localities. There is also a constant demand

for addresses before schools upon the habits of insect's. In this connection, work of special value has been done by Mr. Percy B. Gregson in the public schools of north-western Alberta.

At the Ontario Agricultural College, under Prof. Wm. Lechhead, all the students of the second year receive instruction in economic entomology for half a year. The chief insect pests of the farm, orchard and garden are discussed, and practical exercises are given, so that students may become well acquainted with the forms discussed in the class. All the third year students receive instruction in entomology throughout the year, and in the springtime some of the students are directed specially to work out the life histories of several species of insects. In the fourth year entomology is studied only by those specializing in biology or horticulture. When they graduate, these students are practically acquainted with many of the insects of economic importance, as well as, of course many others.

Several members of the North-west Territorial Natural History Society have done excellent work of a scientific nature in collecting and studying the insects of their respective districts. Mr. F. H. Wolley-Dod's investigations among the Noctuidæ are of special value, and his extensive collection is a source of reference, of which, through his kindness, several students avail themselves. Mr. T. N. Willing, the Territorial Weed Inspector, in his travels through the North west has made, during the past year, large collections, with careful notes, in all orders of insects. It has been impossible to work up all of these as yet, but many species of great interest have been secured. Mr. J. W. Cockle, at Kaslo, B.C.; Messrs. A. W. Hanham and E. M. Anderson, at Victoria, B.C.; the Messrs. J. and T. Wilson, R. V. Harvey and A. H. Bush, at Vancouver, B.C., and Messrs G. W. Taylor and T. Bryant, at Wellington, B.C., have continued to collect energetically during the past season, and have added many rare species to the Provincial list. Mr. E. P. Venables has devoted most of his time to economic entomology. In Manitoba good work has been done by the Messrs. Criddle, of Aweme; Mr. E. F. Heath, of Cartwright; Mr. L. E. Marmont, of Routhwaite, and Mr. A. J. Dennis, of Beulah. The Ontario collectors have been more active than usual. Except at Montreal, not much work has been done in the Provinces of Quebec and Nova Scotia, but Dr. Schmitt, on Anticosti Island, and Mr. W. McIntosh, of St. John, N.B., have continued to prosecute their studies vigorously.

Probably the event of most importance in 1903, as affecting our knowledge of the insect fauna of a most interesting and little explored part of Canada, was the visit of three months paid by Dr. Harrison G. Dyar, with two assistants, Messrs. A. N. Caudell and R. P. Currie, to Kaslo, on Kootenay Lake, B.C., during the collecting season. I had the pleasure of visiting my friend, Mr. J. W. Cockle, the enthusiastic entomologist of Kaslo, when these gentlemen were staying with him, and seeing their methods and some results of their work. Not only from the early hours of daylight, but throughout the day and late into the night the work of collecting and studying life-histories went on incessantly. Besides insects in various orders, over 20,000 lepidoptera were collected, and nearly 200 kinds of larvæ were observed. On his way home, Dr. Dyar visited several of our most active collectors of insects in British Columbia, and gave them much help in the identification of unknown species in their collections. Dr. Dyar intends to prepare an extensive report on his summer's work, which must necessarily be of the keenest interest to all of our entomologists. Kaslo, itself, is a locality presenting exceptional attractions to the naturalist; situated on the lake shore, it provides easy means of access to many mountains which have never been explored. Regular steamboats give opportunities of visiting other localities on the extensive Kootenay Lake, and a railway takes one in a few hours right into the heart of the mountain forests. An expedition to the summit of Mount Kokanee (11,000 feet) produced many rare plants and insects. The ruling genius of the place is Mr. Cockle, a genial friend and a most enthusiastic and indefatigable collector, who has discovered many species new to science.

LITERATURE

Bibliographical notes on works dealing with insects appear regularly in all the standard entomological journals and scientific magazines, such as *The Canadian Entomologist*, *The Ottawa Naturalist*, *Le Naturaliste Canadien*, *Entomological News*, *The American Naturalist*, *Psyche*, *Science*, *Journal of the New York Entomological Society*, etc. These are all indispensable to the working naturalist.

In addition to these, some notable books have appeared during the past year, which will be great helps and time-savers to collectors and students.

DYAR, H.G. List of North American Lepidoptera. United States National Museum, Bull. No. 52.—Undoubtedly the most important book of the year is Dr. Dyar's Catalogue. This large work of 740 pages, prepared with great care and beautifully printed on good paper, has been distributed, free of charge, with the greatest liberality by the Smithsonian Institution to all applicants. It is, therefore, in the hands of all of our active workers, and will doubtless be for a long time the guide for classifying and arranging collections. There will, of course, be many points upon which some will differ from Dr. Dyar, both as to arrangement and as to specific reference of some well known names. Some of our more conservative workers will prefer to retain the names of Prof. J. B. Smith's list, particularly as a new edition has recently appeared; but for the most part, for various reasons I believe Dr. Dyar's list will be accepted by North American entomologists. In the section dealing with diurnal lepidoptera the careful and painstaking work of Dr. Scudder on genera has received more recognition than has previously been accorded it, although in the main Dr. Henry Skinner's catalogue has been followed as to species. The Sphingidae are arranged as by Dr. J. B. Smith's monograph, and naturally, in the Noctuidæ, Dr. Smith, our highest authority, has been followed. The manuscript of the Geometridæ and the Phycitinae and of the Pyralidæ was prepared by the late Dr. G. D. Hulst, the remaining subfamilies of the Tineoidea, together with the Pterophoridae and Tortricidæ, by Dr. C. H. Fernald. Mr. August Busck, the eminent Tineidologist, helped much in the Tineid groups proper and the Gelechiidæ.

It will thus be seen that Dr. Dyar added to his own vast knowledge of the Lepidoptera of North America the latest views of all the leading specialists in the various groups, and, as was well said by Dr. Bethune, the editor of the *Canadian Entomologist*,* "the preparation of this list has evidently involved a very large expenditure of time and labour; we must all acknowledge that the author has placed us under a deep debt of obligation to him. The work, notwithstanding any criticism that may be passed upon it, is an extremely valuable one, and will be found by its possessors to be most useful and, indeed, indispensable. Though we may not agree with it on all points, we must admit its excellence and importance, and we beg to congratulate the author on his achievement, and thank him for what he has accomplished."

Prof. Grote's articles in the *Canadian Entomologist* for 1903, should be read carefully concerning some of the species mentioned in Dr. Dyar's list.

It will be noticed by our readers that an asterisk (*) has been placed before the serial numbers to indicate species not represented in the U. S. National Museum, and it is sincerely hoped that Canadian collectors will not be slow to show their appreciation and gratitude to the authors and the Smithsonian Institution by sending many specimens of northern insects to fill gaps in the magnificent collection at Washington, which is at the disposal of students from the whole world, and where the utmost care is taken for the preservation of the specimens from injury of all kinds.

BEUTENMUELLER, WM. Descriptive Catalogue of the Noctuidæ found within 50 miles of New York City. Part ii., Dec. 1902.—This is a most useful pamphlet of 46 pages, prepared in the author's usual careful manner, and gives good figures and short descriptions of many of

*Can. Ent., 1903, p. 142.

the moths and their larvæ which the beginner has difficulty in identifying. Four plates give beautifully executed figures of 85 species, from drawings of E. L. Hyatt.

BEUTENMUELLER, WM The Hawk-moths of the vicinity of New York City, pp. 31.—This is another most useful pamphlet, which will be of inestimable value to beginners on account of the particularly good illustrations which accompany the descriptions of each of the 48 species mentioned.

FERNALD, MRS. M. E. A Catalogue of the Coccidæ of the world. Mass. Agr. Coll., Special Bulletin, No. 88, pp. 360.—This will be found a most useful book of reference for all students of the Coccidæ. It is the result of nearly 25 years of painstaking labour by a well known and eminent entomologist. One thousand five hundred and fourteen species are listed with full bibliographical references. The notes on food plants and geographical distribution of the species are most helpful.

BLATCHLEY, W. S. The Orthoptera of Indiana, 8 vo., pp. 348.—This is practically a concise and popular manual of the Orthoptera of Indiana. It will be found of the greatest help to all, whether they live in Indiana or Canada, who may wish to take up the study of this very important, but much neglected order.

SMITH, J. B. Check List of the Lepidoptera of Boreal America, June, 1903.—There is no man living, who has done more for the struggling students of entomology in Canada than everybody's friend, Dr. J. B. Smith. His patience, kindness and prompt attention in identifying species and to all applications for information are unexcelled. The recent appearance of a new edition of his Check List immediately following Dr. Dyar's Catalogue will therefore place many students in a difficult and uncertain position. The question will be: Whose arrangement are we going to adopt? and this, each one must settle for himself. In the first place, everyone should get the check list, then find out the differences and try and decide whether the changes were advisable. In this way, at any rate, much valuable knowledge will be acquired. Dr. Smith is a close student and a frank correspondent, always willing to discuss fairly any problem submitted to him.

HOLLAND, W. J. The Moth Book. Doubleday, Page & Co., New York, \$4.00.—Just as we are going to press, the much looked for Moth Book has come to hand. It is a handsome volume, uniform with the Butterfly Book and the Insect Book, excellently printed and profusely illustrated with 48 magnificent coloured plates giving 1,500 figures of North American moths. These alone are worth far more than the whole price of the book. The letter press, as must necessarily be the case when such an enormous field is covered, will be found disappointing to a certain degree, not so much for what is given as for the lack of the further information which is necessarily omitted. As the author himself states in the preface, "The brevity in description is, however, abundantly compensated for by the illustrations." There are over 300 text cuts, besides the coloured plates. Some of these are excellent, but others seem hardly up to the quality of the rest of the book. Unfortunately, this book again has a somewhat different nomenclature from either of the publications by Dr. Dyar and Dr. Smith referred to above. The reasons for some of the changes are given, which will help the student to correctly understand the true nature of many genera; but beginners, finding such wide differences of opinion between leading authorities, will, it is to be feared, be for some time at any rate considerably confused. This difficulty, however, must necessarily stimulate much original thought and investigation, which will eventuate in a better knowledge of North American systematic entomology. On the whole, the Moth Book will be found one of the most useful accessible publications which has ever appeared upon American entomology.

FELT, E. P. Aquatic Insects in New York State. (N. Y. State Museum, Bull, 18, Entomology). This is a sumptuous volume of 300 pages lavishly illustrated with 52 beautifully executed plates and a few text-cuts. It is a study at the Entomological Field Station, Ithaca,

N. Y., under the direction of Dr. Felt, by the well known specialists, Dr. J. G. Needham, A. D. McGillivray, O. A. Johannsen and Dr. K. C. Davis. It adds enormously to our knowledge of aquatic insects and is a publication replete with information, a large part of which is altogether new.

SPECIALISTS.

The record this year is again chiefly made up of notes on lepidoptera and coleoptera. Extensive lists of diptera have been sent in by Mr. Harvey, of Vancouver, and Mr. McIntosh, of St. John and many other collectors in different parts of Canada have material now under examination. With regard to hemiptera, Mr. Stevenson, of Montreal, Mr. Metcalfe, of Ottawa, Mr. Hanham, of Victoria, and Mr. Taylor, of Wellington, have made large collections, which are now being worked up by Mr. Van Duzee and other specialists. I hope to give a considerable amount of space next year to these two orders. The orthoptera have been studied to a considerable extent by Mr. T. N. Willing, and Mr. N. Criddle in the West, by Mr. E. M. Walker in Ontario and by the Rev. Dr. Fyles in Quebec.

Of those making a special study of certain groups or orders, the following may be mentioned, so that anyone wishing to help them in their studies by sending material for examination or wishing to correspond may know of them. A sufficient address is given for each in the list of active workers herewith.

Life-histories—Messrs. Lyman, Brainerd, Fyles, Young, Gibson, Fletcher, Cockle.

Diurnals—Messrs. Lyman, Wolley-Dod, Fyles, Willing, Marmont, Hanham, Heath and Fletcher.

Nocturnals—The genus *Hydroecia*, Messrs. Lyman, Winn, Norris and Brainerd, Montreal. The genus *Apantesis*, A. Gibson, Ottawa. The genus *Paragrotis* (*Carneades* and *Euxoa*) and its allies, F. H. Wolley-Dod, Millarville. The Geometridæ of North America, Rev. G. W. Taylor, Wellington; Mr. Taylor has corresponded with all interested in this family and has now amassed an enormous collection, probably one of the largest on the continent. He has worked these up from the descriptions and is now ready to assist anyone who will send him material.

ACTIVE WORKERS.

The following list gives the names of the most active workers in Canada which have been heard from during the past year. There are doubtless many others, but I have not heard from them during 1903. The initials in parentheses after their names indicate the orders they are studying, or if they have general collections.

Anderson, E. M., Victoria, B. C. (L.)
Bethune, Rev. C. J. S., London, Ont. (Gen., L., C.)
Bégin, Rev. P. A., Sherbrooke, Q. (Gen.)
Bice, J. London, Ont. (L.)
Baird, Thomas, High River, Alta. (Gen.)
Browne, Edgar J., London, Ont. (L., C.)
Brainerd, Dwight, Montreal. (L.)
Bryant, Theodore, Wellington, B. C. (L.)
Burman, Rev. W. A., Winnipeg. (Gen.)
Bush, A., Vancouver, B. C. (L.)
Chagnon, Gus., Montreal. (D., C.)
Cockle, J. W., Kaslo, B. C. (L.)
Criddle, N., Aweme, Man. (L., Or., C.)
Crew, R. J., Toronto. (C.)
Dennis, A. J., Beulah, Man. (L.)
Desrochers, Rev. J. E., Rigaud, Q. (L., C.)
Dod, F. H. Wolley-, Millarville, Alta. (L.)
Draper, R., Vancouver. (L.)
Evans J. D., Trenton, Ont. (Gen., L., C., Hym.)
Fanshawe, Lyonell, Tamarisk, Man. (L.)

Findley, Rev. G. H., Ainsworth, B. C. (L.)
Fletcher, Dr. J., Ottawa. (Gen., L., C.)
Fyles, Rev. Thos. W., Levis, Que. (Gen., L., Hym.)
Garrett, C., Didsbury, Alta. (L.)
Gibbon, H., Beulah, Man. (L.)
Gibson, Arthur, Ottawa. (L., Gen.)
Grant, C. E., Orillia, Ont. (L.)
Gregson, P. B., Blackfalds, Alta. (Gen.)
Guignard, J. A., Ottawa. (Gen., Hym.)
Hanham, A. W., Victoria, B. C. (L., D., C.)
Harrington, W. H., Ottawa. (C., Hym., Hem., D.)
Harvey, R. V., Vancouver. (L., Odon.)
Heath, E. F., Cartwright, Man. (L.)
Huard, Rev. Victor, Quebec. (Gen.)
Hudson, A. F., Calgary, Alta. (L.)
Jones, W. A., Dashwood, New Westminster, B. C. (L.)
Keen, Rev. J. H., Metlakatla, B. C. (C.)
Lochhead, Prof. W., Guelph Ont. (Gen., Or.)

- Lymn, H. H., Montreal (L.)
 McIntosh, W., St. John, N. B. (L., D., C.,
 MacLaughlin, T. J., Ottawa. (Odon.)
 Marmont, L. E., Rounthwaite, Man. (L.)
 Metcalfe, W., Ottawa (L., C., Hem.)
 Moffat, J. A., London. (L.)
 Moore, W. W., Montreal. (Hem.)
 Morden, J. A., London, Ont. (L.)
 Parsons, C., London. (L., C.)
 Perrin, Jos., Halifax, N. S. (L.)
 Norris, A. E., Montreal. (L., Hem.)
 Ouellet, Rev. C. J., Montreal. (C., Hym.)
 Richard, A. E., Ottawa. (L.)
 Roy, Rev. Elias, Levis, Q. (C.)
 Sandercock, W. C., Lauder, Man. (L.)
 Saunders, H. S., Toronto. (L.)
 Simpson, Willibert, Ottawa. (C.)
 Suffield, J. D., Morden, Man. (L.)
 Sanson, N. B., Banff, Alta. (Gen., L.)
 Schmitt, Dr. J., Anticosti. (Gen.)
 Stevenson, Charles, Montreal. (L., G., Hem.)
 Tanton, J., London, Ont. (L.)
 Taylor, Rev. G. W., Wellington, B. C. (L.,
 Hem., C.)
 Tipping, Dalron, Blackfalds, Alta. (Hym.
 Gen.)
 Venables, E. P., Vernon, B. C. (L., C.,
 Hym.)
 Walker, E. M., Toronto. (Or. Odon.)
 Winn, A. F., Montreal. (L.)
 Wilson, E., Vancouver. (L.)
 Wilson, Jno., Vancouver. (L.)
 Wilson, T., Vancouver. (L.)
 Wilson, W. J., Ottawa. (Gen.)
 Williams, J. B., Toronto. (L.)
 Willing, T. N., Regina. (L., Or., C.)
 Young, C. H., Hurdman's Bridge, Ont. (L.)

NOTES OF CAPTURES

LEPIDOPTERA.

(Arranged according to Dyar's List of North American Lepidoptera, U.S.N.M., Bull. No. 52.)*

RHOPALOCERA.

(Dyar's number.)

11. *Papilio glaucus*, L., *a. turnus*, L. A typical specimen, Kaslo, B. C., (Cockle).
14. *Papilio thous*, L., (*crasphontes*). Lakeview, 15 miles from Halifax, N.S., Aug. 1901,
(Miss H. King, teste J. Perrin).
16. *Papilio machaon*, L., *a. alaska*, Scud. Hudson Bay slope. Forget Portage, Naga-
gami River, 63 miles northward of Montizambert Station, C.P.Ry., and 22 miles
north of height of land, measured along the canoe routes, Lat. 49° 12' 47", (W. J.
Wilson).
18. *Papilio zolicaon*, Bdv. Beulah, Man., (Dennis).
38. *Pontia napi*, L., *g. virginicensis*, Edw. Abundant, Cote St. Paul, Que., May 3 and 10,
(Stevenson).
85. *Eurema enterpe*, Men. (*lisa*, Bdv.). De Grassi Pt., Lake Simcoe. One, Aug. 4,
(Walker).
95. *Speyeria idalia*, Dru. Grand Bend, Lake Huron, July, (H. S. Saunders).
216. *Eugonia californica*, Bdv. Cartwright, Man., Sept. 5, the only one seen this year,
(Heath). Enormously abundant in many parts of the Kootenay country, as at
Nelson, B.C., Trail, B.C., and Robson, B.C., (Fletcher). Common here, but mil-
lions are reported from Rossland by Danby. The only food plant here is *Oeano-*
thus, Kaslo, (Cockle).
222. *Vanessa carye*, Hub. Swarming at Vancouver, (Harvey).
271. *Erebia Vidleri*, Elwes. Very abundant on Mt. Cheam, B.C., Aug. 3-8, (Harvey
Bush, J. Wilson).
284. *Ctenonympha typhon*, Rott., *a. laidon*, Bork. (*inornata*, Edw). This was recorded
in error to have been taken last year at St. Hilaire, Que., by Mr. Stevenson. The
specimen was taken at Piedmont, Que.
286. *Enodia portlandia*, Fab. Niagara Glen, Ont., July 1 and 25, (Williams).

* This arrangement was decided upon after discussion at the Annual Meeting of the Society held at Ottawa in September, 1903.

358. *Thecla spinetorum*, Bdv. Kaslo, June 1, (Dr. H. G. Dyar).
 374. *Incisalia irus*, Gdt. Cole Harbour, N.S., June 3, and Halifax, May 17, (Perrin).
 383. *Erora leta*, Edw. Meech Lake, Que., two specimens, May 18, (Young).
 437. *Rusticus anna*, Edw. Wellington, B.C., July 20, (Taylor).

HEPEROCERA.

659. *Lepisesia Clarkae*, Bdv. Goldstream, B.C., May 24, June 7. Rare, (Hanham).
 803. *Crambidia casta*, Sanborn. Millarville Alta., (Dod.); Kaslo, (Cockle); Rounthwaite, July 25 to Aug. 25, (Marmont); Brandon, Aug. 27th, (Hanham). Grand Forks, B.C., Aug. 10, (Fletcher). Ottawa, Aug., (Saunders and Fletcher).
 806. *Lexis bicolor*, Grote. Rounthwaite, August, (Marmont); Nepigon, (Fletcher); Kaslo, (Cockle).
 846. *Ecpantheria deflorata*, Fab. London, Ont., (Bethune).
 853. *Estigmene prima*, Sloss. Mer Bleue, near Ottawa, May 25, (Gibson). This is the form referred to by Mr. Lyman, Can. Ent. xxxiii, p. 93, as the heavily spotted Gormin swamp form and is very different from Mrs. Slosson's type of *prima*.
 869. *Neoarctia yarrowi*, Stretch, *a. remissa*, Hy. Edw. One on Mount Cheam, near summit, (J. Wilson).
 876. *Apantesis michabo*, Grt. One specimen, May 20, Rounthwaite, (Marmont).
 878. *Apantesis parthenice*, Kirby. A beautiful variety of this common arctian was bred by Mr. Marmont at Rounthwaite during the past season, in which, instead of the usual red secondaries, this had them of a rich buff yellow.
 879. *Apantesis oithona*, Str., *a. rectilinea*, French. At light, Aug. 5, Rounthwaite, (Marmont); bred from larvae on *Castilleja sessiliflora*, Aweme, (Criddle and Fletcher).
 888. *Apantesis nevadensis*, G. & R., *b. superba*, Stretch. Bred at Ottawa from larvae sent from Vernon, B.C., (Venables).
 934. *Emilia roseata*, Walk. One specimen emerged June 19 from chrysalis found at Goldstream, V.I., in May, (Hanham); Mission City, B.C., July, (J. Wilson).
 996. *Apatela manitoba*, Sm. Aweme, July 1, (Criddle).
 1010. *Apatela minella*, Dyar. May 19. Kaslo, (Cockle).
 1016. *Apatela falcula*, Grt. Cartwright, June 19, (Heath).
 1025. *Apatela ovata*, Grt. At light and sugar, Cartwright, (Heath).
 1029. *Apatela speratus*, Grt. St. John, N.B., July 7th, (McIntosh); Aweme, Man., (Criddle); Ottawa, (Young).
 1033. *Apatela emiculata*, Sm. Cartwright, May 11, (Heath).
 1042. *Apatela lanceolaria*, Grt. July, Rounthwaite, (Marmont).
 1052. *Merolonche spinea*, Grt. Kaslo, Aug. 19, (Cockle).
 1059. *Jaspidia (Bryophila) teratophora*, H.-S. At light, July 11, Trenton, (Evans).
 1073. *Baileya (Leptina) ophthalmica*, Gn. Meech Lake, May 17, (Young).
 075. *Baileya Doubledayi*, Gn. Brownsburg, Que, Aug., (Brainerd); Toronto, (Gibson).
 1076. *Baileya dormitans*, Gn. June 13, Cartwright, (Heath).
 1145. *Hillia crassis*, H.-S. At light, Ottawa, Sept. 21, (Fletcher).
 1148. *Hadena Evelina*, French. Wellington, B.C., (Bryant).
Hadena ferens, Sm. Millarville, (Dod).
 1165. *Hadena diversicolor*, Morr. Ottawa, Aug. 27, (Young, Fletcher).
 1170. *Hadena tonsa*, Grt. Millarville. Rare, (Dod).
 1211. *Hadena stipata*, Morr. At sugar, Meech Lake, (Young).
 1228. *Hadena plutonia*, Grt. Aweme. July 19, (Criddle).
 1246. *Hadena relecina*, Morr. Rounthwaite, Sept. 1, (Marmont). Aweme, (Criddle).
 1259. *Polia Theodori*, Grt., *a. epichysis*, Grt. Kaslo, (Cockle).

1261. *Polia confragosa*, Morr. Sept. 29, Oct. 2, at light, Cartwright, (Heath).
1268. *Polia medialis*, Grt. Two specimens, had only taken two previously, Millarville, (Dod). Meech Lake, Que. Several specimens 19 & 21 Sept., (Young).
Feralia columbiana, Sm. Can. Ent., 1903, p. 10. New Westminster, B.C., (Dashwood-Jones). Several in May. Vancouver, (Bush); Nanaimo, (Harvey).
1411. *Rhynchagrotis costata*, Grt. Victoria, July 18, (Anderson); Kaslo, (Cockle); Wellington, (Bryant).
1412. *Adelphagrotis stellaris*, Grt. Wellington, (Bryant).
Agrotis ornithus, Sm. Jour. N.Y. Ent. Soc. March, 1903, Kaslo, (Cockle).
1426. *Semiophora climata*, Gn. Ottawa, Aug. 31, (Young); St. John, abundant, (McIntosh).
1427. *Semiophora opacifrons*, Grt. Bred at Ottawa, emerged Aug. 3. (Fletcher).
1440. *Pachnobia Fishii*, Grt. May 24, St. John, (McIntosh).
1449. *Setagrotis vernilis*, Grt. July 25, Kaslo, (Cockle).
1450. *Setagrotis infimatis*, Grt. Wellington, (Bryant).
1455. *Agrotis geniculata*, G. & R. Montreal, (Winn).
1479. *Noctua Treatii*, Grt. Cartwright, June 19, July 22, (Heath); Millarville, (Dod).
1485. *Noctua rubifera*, Grt. Chilliwack, B.C., Aug., (Harvey).
1503. *Noctua plebeia*, Sm. Victoria, Aug. 1, (Anderson); Wellington, (Bryant).
1506. *Noctua substrigata*, Sm. Millarville, rare, (Dod). Regina, (Willing).
1508. *Noctua Calgary*, Sm. Wellington, (Bryant); Millarville, (Dod).
1511. *Noctua cynica*, Sm. A very rare species. July 25, at light, Cartwright, (Heath).
1520. *Chorizagrotis soror*, Sm. Sept. 6, Kaslo, (Cockle).
1535. *Feltia robustior*, Sm. Aweme, Aug. 29, (Criddle).
1569. *Paragrotis segregata*, Sm. Always scarce. Sept. 29, Cartwright, (Heath).
1692. *Paragrotis intrita*, Morr. Three specimens. Not seen for years, Millarville, (Dod).
Paragrotis focius, Sm. Jour. N.Y. Ent. Soc. March, 1903, Calgary, (Dod); Wellington, (Bryant).
Paragrotis maimes Sm. (Can. Ent. 1903, p. 131, where several other new species of Canadian noctuids are described.) Brandon, (Hanham); Millarville, July 27-Aug. 21, (Dod).
1699. *Paragrotis tibubatis*, Sm. Cartwright, July 25, (Heath); Wellington, (Bryant).
1721. *Paragrotis furtivus*, Sm. Cartwright, July 25, (Heath).
1734. *Paragrotis colata*, Grt. Mount Cheam, Aug. 9, (Bush).
1756. *Anylus profundus*, Sm. Cartwright, Sept. 2, (Heath).
1793. *Mamestra radix*, Walk. 1 specimen at currant bloom, uncommon. May 31, Cartwright, (Heath).
1797. *Mamestra gussata*, Sm. Cartwright, June 13, (Heath); Winnipeg, (Hanham).
1801. *Mamestra trifolii*, Rott., a. *Oregonica*, Grt. Cartwright, July 22, (Heath); Mt. Cheam, Aug. 6, (Bush).
1813. *Mamestra variolata*, Sm. Victoria, Aug. 1, (Anderson).
1825. *Mamestra Goodellii*, Grt. Cartwright. "This has been hitherto confused with *acolerica*, Sm.", (Heath).
1830. *Mamestra stricta*, Wlk., a. *cinnabarina*, Grt. Wellington, (Bryant).
1877. *Mamestra circumcincta*, Sm. 2 more specimens of this beautiful species were taken at Aweme on June 27, (Criddle). The record made last year from Cartwright was a mistake, as, so far, it has not been taken there.
1894. *Xylomiges dolosa*, Grt. Meech Lake, May 18, (Young).
1895. *Xylomiges rubrica*, Harvey. Vancouver, April. "This is near *pulchella* but is much paler, is redder and less contrasting in colour," (Harvey).

1896. *Xylomiges perhibens*, Grt. Wellington, (Bryant).
1902. *Xylomiges peritalis*, Sm. Vancouver, May, (Harvey).
Nephelodes tertialis, Sm. Jour. N.Y. Ent. Soc., March, 1903. Winnipeg, Aug. 16-24, (Hanham).
1973. *Heliophila megadiala*, Sm. Wellington, (Bryant); Cartwright, "very similar to *insueta*," (Heath).
1953. *Heliophila minorata*, Sm. Cartwright. This is the Manitoban form of *pallens*, (Heath).
1983. *Heliophila Calgariana*, Sm. Wellington, (Bryant); July 25, Victoria, (Hanham).
1998. *Orthodes recors*, Gn. Ottawa, reared from larva, (Gibson).
2023. *Graphiphora Columbia*, Sm. Millarville, (Dod).
2072. *Aporophila Yosemite*, Grt. Millarville, (Dod).
2076. *Pleroma apposita*, Sm. Wellington, (Bryant).
2088. *Xylina dilatocula*, Sm. Wellington, (Bryant). This is a very rare species.
2101. *Xylina Oregonensis*, Harvey. Victoria, April 14, (Anderson).
2126. *Cucullia portera*, Gn. June, Cartwright, (Heath).
2128. *Cucullia florea*, Gn. "At wild currant bloom, June 1, Rounthwaite," (Marmont); Cartwright, June 28, (Heath).
- Rancora albicincta*, Sm. Can. Ent. 1903, p. 137. Boucher, Sask., N.W.T., (E. Coubeaux). 6 sp. April 24, Rounthwaite, (Marmont). Head of Pine Creek near Millarville, (Dod).
2154. *Nonagria latta*, Morr. Montreal, Aug. 20, (Stevenson).
2166. *Gortyna stramentosa*, Gn. At light. Aug. 20, Montreal, (Norris, Winn).
2168. *Gortyna medialis*, Sm. Very abundant, Aug. and Sept., St. John, (McIntosh); Millarville, (Dod).
2172. *Papaipema inquesita*, G. & R. Montreal, Sept., (Brainerd).
2173. *Papaipema speciosissima*, G. & R. At light, Montreal, (Chagnon, Stevenson).
Papaipema Harrisii, Grt. At light, Ottawa, Oct., (Gibson).
2183. *Papaipema cerussata*, G. & R. Montreal. I bred a fine aberration of this species with all the usual spots obscure, (Brainerd). A similar specimen was also bred at Ottawa by Mr. Young. Bred from stems of *Thalictrum*, (Norris).
2188. *Papaipema impecuniosa*, Grt. Montreal. Sept., (Winn). Ottawa, (Fletcher).
2200. *Xanthia pulchella*, Sm. Wellington, (Taylor).
2210. *Pseudoglossa blanda*, Grt. Rare at sugar, Sept. 4 to 15, Victoria, (Hanham).
2220. *Orthosia decipiens*, Grt. Wellington, (Bryant).
2244. *Scopelosoma devia*, Grt. Sept., Rounthwaite, (Marmont); Ottawa, Oct. 17, (Fletcher).
2301. *Heliothis phlogophaeus*, G. & R. (*dipsarcus*, Sm.) Bred, Montreal, (Brainerd).
2395. *Melaporphyria immortua*, Grt. At wild currant bloom, Rounthwaite, (Marmont).
2396. *Melaporphyria prorupta*, Grt. I specimen of this beautiful moth was taken at Osoyoos, B.C., by Mr. C. de B. Green some years ago, and has been recently named by Dr. Dyar.
Melicleptria Kasloa, Sm. Kaslo. rare, (Cockle).
2481. *Eosporopteryx thyatiroides*, Gn. Montreal, (Norris); Ottawa, 2 sp., (Young).
2508. *Autographa vaccinii*, Hy. Edw. Very common, St. John, (McIntosh).
2524. *Autographa corrusca*, Strecker. Hatzic, B.C., Aug., (Draper); Wellington, (Bryant).
2533. *Syngrapha ignea*, Grt. "Commoner than usual," Millarville, (Dod).
2777. *Cirrhobolina deducta*, Morr. July 22, Kaslo, (Cockle).

2784. *Syneda Alleni*, Grt. St. John, June 19, (McIntosh); Aweme, June 20, (Criddle).
2788. *Syneda ochracea*, Behr. July 10, Kaslo, (Cockle).
2825. *Catocala elda*, Behrens. "Not uncommon this year at sugar, but very hard to catch." Sept., Victoria, (Hanham).
2826. *Catocala relictæ*, Wlk., *b. phrynia*, Hy. Edw. Ottawa, Sept. 26, (Fletcher). This is a beautiful suffused specimen with the upper wings entirely covered with black scales. If taken on Vancouver Island it would be passed over for *elda*.
2832. *Catocala Frenchii*, Poling. Victoria, a week or ten days earlier than *elda*, (Hanham).
2848. *Catocala unijuga*, Walk., var. *Fletcheri*, Btmr. A new variety, which was collected by Mr. T. N. Willing, of Regina, when living at Olds, Alta., about 60 miles north of Calgary. It is like the typical form in markings, but the bands on secondaries, instead of being red, are of a dark yellowish sooty drab.
2889. *Catocala abbreviatella*, Grt. "Very scarce at sugar," July 25, Cartwright, (Heath).
2923. *Remigia repanda*, Fab. 2 sp. taken at sugar. Never collected at Ottawa before. (Fletcher).
3006. *Erebus odora*, L. Meech Lake, Que., Aug. 2, (Young).
3007. *Thysania Zenobia*, Cran. 1 sp. at light, middle of August, Renforth, 5 miles from St. John, (McIntosh). (The most interesting capture of the year.)
3091. *Apotelodes angelica* Grt. 1 sp. July 6, at light, Trenton, (Evans).
3117. *Notodonta similaria*, Graef. "Very rare here, 1 sp. at light, June 29." Cartwright, (Heath).
3146. *Ianassa Coloradensis*, Hy. Edw. July 10, Cartwright, (Heath).
3180. *Euthyatira pudens*, Gn. 3 sp. on dates somewhat apart, April 21, May 11 and 28, Victoria, (Hanham); Kaslo, June 6, (Cockle).
3181. *Euthyatira semicircularis*, Grt. 2 sp., June 18 and 25, Victoria, (Hanham).
3185. *Gynephora Rossii*, Curtis. This rare arctic species has been reared from larvæ collected on willows in 1902 at Blackfalds, Alta., by Mr. P. B. Gregson. During the past summer the larvæ were extremely common on willows and poplars at that place, and several specimens were sent to me by Mr. Gregson and Mr. Dalton Tipping.
3236. *Nyctobia nigroangulata*, Strk. Common in spring, Wellington, (Taylor, Bryant).
3336. *Eucheia albifera*, Wlk. Wellington, (Bryant).
3338. *Coryphista Meadii*, Pack. Wellington (Bryant).
3384. *Mesoleuca ethela*, Hulst. Wellington, (Taylor, Bryant).
3396. *Hydriomena sparsimacula*, Hulst. Wellington. (Bryant).
3405. *Hydriomena costigutta*, Hulst. Common, Wellington. "This species has been going under the name of *Petrophora abrasaria*, H.-S., which it somewhat resembles." (Taylor.)
3428. *Cenocalpe Morrisata*, Hulst. New Westminster, (Jones).
3434. *Cenocalpe topazata*, Strk. Mount Cheam, (Harvey).
3460. *Petrophora convallaria*, Gn. Wellington. "I have been able to separate this from *P. defenaria*, with which it has been confused. It is much rarer." (Taylor.)
3603. *Epelis truncataria*, Wlk. Aweme, (Criddle). Mr. Taylor writes: "This is quite distinct from *Faonii*, Minot, which has been placed in synonymy with it by a printer's error in Dyar's Catalogue."
3610. *Dasyfidonia avuncularia*, Gn. Several specimens sent from Osoyoos, B.C., by Mr. C. de B. Green. This, I think, is the first Canadian record.
3628. *Deilinia feminaris*, Gn. Cameron Lake, V.I., (Taylor).
3747. *Sympherta tripunctaria*, Pack. Wellington, (Bryant).

3760. *Enemera jutunaria*, Gn. "Common at Cameron Lake, but, so far, not taken elsewhere on Vancouver Island," (Taylor).
3767. *Caripeta equalitaria*, Grt. Victoria, (Taylor); Kaslo, (Cockle).
3769. *Phengommatæa Edwardsata*, Hulst. Wellington, 1 sp., (Bryant). Rather scarce, Kaslo, (Cockle).
3776. *Enypia venata*, Grt. "Common at Cameron Lake, but not taken elsewhere on Vancouver Island," (Taylor).
3782. *Nepytia phantasmaria*, Strk. "Common at Central Park, near Victoria, Sept and Oct. This is the western representative of *Nepytia semiclusaria*, Wlk." (Taylor).
3848. *Cleora indicataria*, Wlk. Wellington, (Bryant).
3876. *Apocheima Rachelæ*, Hulst. Rounthwaite, several males, Apl. 15 to 25 (Marmont). Eggs of this remarkable species were received from Mr. Criddle last spring, and full notes of the life-history taken up to the pupa.
3883. *Erannis defoliaria*, Clerck. a. *Vancouverensis*, Hulst. Nov. 19, Victoria, (Anderson). "This moth appears to be no longer a common insect here. Single specimens were taken Nov. 23 and 25, none seen last year," (Hanham).
3965. *Euchlena pectinaria*, D. & S. Not uncommon. Wellington, (Taylor).
4041. *Leucobrephe M dendorfi*, Men. Beulah, Man., April 16, (Dennis).
4055. *Roeselia minuscula*, Zell. At rest on fir tree, May 18, Victoria, (Anderson). Dr. Dyar says that this is an extremely rare insect.
4132. *Thyris lugubris*, Bdv. Rounthwaite, (Marmont). Sandhills near Aweme, flying in bright sunshine, July 20, (Criddle, Fletcher).
4143. *Cossus undosus*, Lint. Kaslo, July 27, (Cockle).
4173. *Podotesia syringæ*, Harr. Hurdman's Bridge, near Ottawa, May 28, (Young).
4406. *Phlyctenia Washingtonis*, Grt. Plentiful, Goldstream and Oak Bay, June 7 to 17, (Hanham); Victoria, May 20, (Anderson).
4551. *Prionapteryx nebulifera*, Stephens. Aweme, Man., (Criddle).
5912. *Ethmia longimaculella*, Cham. Rigaud, (Desrochers).
6603. *Sthenopsis thule*, Strk. Several taken at Montreal South, flying from 8.45 to 9.30, p.m., July 5 to 16, (Mrs. C. Stevenson).

COLEOPTERA.

Cicindelidae. The Canadian species are now being specially studied by Mr. E. D. Harris, of 280 Broadway, New York, who will be glad to receive specimens from all localities.

169. *Cychrus angulatus*, Harr. Wellington (Taylor); Goldstream, B.C., May 17, one under stone just killed by large black spider, (Hanham).
128. *Calosoma Wilcoxi*, Lec. 1 sp. under stone, Montreal Mountain, July 26, 1902, (A. Denny).
165. *Blethisa multipunctata*, L. May 27, Aweme, (Criddle).
167. *Loricera cærulescens*, L. Laval Co., Que., June 7, (Stevenson).
179. *Notiophilus Hardyi*, Putz. Very abundant, I could have caught hundreds, found under every pile of dead scrub, Tamarisk, Man., (Fanshawe).
189. *Nebria Gebleri*, Dej. Vernon, (Venables).
300. *Nomius pygmaeus*, Dej. Goldstream, April 13, under bark of fallen Douglas spruce, (Hanham).
313. *Bembidium nitidum*, Kby. May 7, Aweme, (Criddle).
416. *Bembidium mutatum*, G. & H. April 4, May 6, Aweme, (Criddle).
- Bembidium fuscicornum*, Mots. Aweme, (Criddle).

646. *Amara exarata*, Dej. St. John, common, (McIntosh).
 722. *Dicelus sculptilis*, Say. April 23, Aweme, (Criddle).
 883. *Lebia pumila*, Dej. May 14, Aweme, (Criddle).
 899. *Lebia ornata*, Say. 2 sp., July 13, St. John, (McIntosh).
 911. *Blechnus nigrinus*, Mann. April 7 and 14, Aweme, (Criddle).
 990. *Zacotus Matthewsii*, Lec. Victoria, B.C. In three seasons I have only seen half-a-dozen of these fine beetles, four turned up in my garden and one was taken at sugar in Sept. *Cychrus angusticollis*, and *Curabus Oregonensis* are frequent visitors to my sugar in Sept., (Hanham). I was much surprised to find a specimen of this magnificent Broscid in some miscellaneous material sent to me by Mr. Cockle from Kaslo, B.C., (Fletcher).
 1027. *Chelonius harpalinus*, Esch. Swan Lake, Victoria, (Hanham).
 1028. *Chelonius interruptus*, Harr. Swan Lake, Victoria, in April, (Hanham).
 1384. *Ilybius quadrimaculatus*, Lec. Mouth of Skeena River, B.C., (Keen).
 1662. *Sphaeridium scarabaeoides*, L. St. John, rare, (McIntosh).
 3186. *Aphorista rittata*, Fab. 1 sp. under a stone, April, Aylmer, Que., (Gibson).
Pedilophorus Lecontei, Wickham. Can. Ent., 1903, p. 180. Vernon, (Venables).
 3883. *Pedilophorus oblongus*, Lec. Vernon, (Venables).
 9942. *Hister umbrosus*, Casey. Vernon, (Venables).
 38-7. *Cylilus sericeus*, Forst. St. John, (McIntosh).
 3898. *Syncahypta echinata*, Lec. Trenton (Evans).
 4108. *Cardiophorus convexus*, Lec. Common, St. John, (McIntosh).
 4282. *Agriotes fucosus*, Lec. Inverness, B.C., July 20, (Keen).
 4287. *Agriotes limosus*, Lec. Common, St. John, (McIntosh).
 4382. *Pityobius anguinus*, Lec. Bred from pupa found in old hemlock spruce log^s Chelsea, Que., June, (Gibson); St. John, rare, (McIntosh).
 4384. *Athous Brightwelli*, Kby. 1 sp., St. John, (McIntosh).
 4651. *Chrysobothris scabripennis*, L. and G. July 4, St. John, (McIntosh).
 5178. *Clerus sphageus*, Fab. Vernon, May 28, (Venables).
 5275. *Hadrobregmus foreatus*, Kby. Montreal, March 22, (Stevenson).
 5327. *Conocara Californica*, Lec. Mt. Arrowsmith, B.C., bred from *Lycopodon*, Sept., (Fletcher).
 5456. *Onthophagus nuchicornis*, L. Common, St. John, (McIntosh).
 5590. *Odontas cornigerus*, Melsh. Ottawa, (Fletcher, Richard); not common, St. John, (McIntosh).
 5851. *Cotalpa lanigera*, L. June, Aweme, Manitoba, (Criddle).
 6092. *Obrinus rubrum*, Newm. Côte St. Paul, Que., June 28, (Mrs. C. Stevenson).
 6141. *Batyë suturalis*, Say. 4 sp., July 27, Aweme, (Criddle).
 6179. *Xylotrechus colonus*, Fab. Oct 10 (!), a very late date, Montreal, (E. Denny).
 6180. *Xylotrechus sagittatus*, Germ. Ottawa, (Fletcher); St. John, (McIntosh).
 6279. *Bellamira scalaris*, Say. St. John, rare, (McIntosh).
 6330. *Leptura nigrella*, Say. Montreal, (Stevenson).
 6332. *Leptura canadensis*, Fab., var. *erythroptera*, Kby. Kaslo, (Cockle); Vernon, (Venables); St. John, very rare, (McIntosh).
 6423. *Leptostylus macula*, Say. Aweme, June, (Criddle).
 6437. *Lepturges querci*, Fitch. Montreal, July 1, (Stevenson).
 6450. *Hoplosia nubila*, Lec. Bred from Basswood, June, Ottawa, (Fletcher).
 6497. *Oberea quadricollis*, Lec. Sicamous, B.C., Aug., (Fletcher); Vernon, (Venables).
 6533. *Donacia magnifica*, Lec. Rare, St. John, (McIntosh).

6544. *Donacia femoralis*, Kby. Inverness, B.C., July, (Keen).
 6972. *Haltica punctipennis* Lec. June 27 to Aug. 10, common, Aweme, (Criddle).
 7082. *Odontota nervosa*, Panz. Not common, St. John, (McIntosh).
Cassida viridis, L. Dr. Fyles writes from Quebec. "This beetle has again made its appearance in strength. I noticed it first this year on May 29." In my reference to this species in the Entomological Record for 1902, I stated that comment had been made upon Dr. Fyles's article in the Canadian Entomologist by Rev. Elias Roy. This, I regret to find, was a careless mistake on my part, as it was the editor of "Le Naturaliste Canadien" who wrote the comment referred to in a footnote to Mr. Roy's paper. (J. Fletcher).
 7304. *Cebus globosus*, Lec. Cordova Bay, B.C., May 31, quite numerous in one spot buried in the sand near to, or partly under, logs on the beach, (Hanham).
 7356. *Eleodes pimelioides*, Mann. Common under logs, Vernon, (Venables).
 7584. *Ægialites debilis*, Mann. Fine series of this very rare beetle, with the larvæ and pupæ, have been sent from Metlakatla, by Rev. J. H. Keen.
 7680. *Eustrophus bifusciatus*, Say. Côte des Neiges, Que., Apr. 10, (Stevenson).
 7729. *Ditylus gracilis*, Lec. Metlakatla, June, (Keen).
 7993. *Schizotus cervicalis*, Newm. Côte St. Paul, Que., May 10, (Stevenson).
 8346. *Sitones hispidulus*, Germ. Trenton, "very common this autumn, not previously taken," (Evans).
 8540. *Grypidius equiseti*, Fab. Not common, St. John, (McIntosh).
 8613. *Magdalis Lecontei*, Horn. On pine tree, Vernon, May 25, (Venables).

HYMENOPTERA.

The record of Hymenoptera for 1903 was to have been prepared by Mr. W. H. Harrington, but exceptionally heavy official work has made this impossible, and that record must be held over.

ORTHOPTERA.

Not much has been done in the way of sending in records of Orthoptera collected during the year, but the following interesting notes from Mr. E. M. Walker, our only Canadian authority on this order, will be read with interest.

"In last year's Record I sent you the name *Nemobius palustris*. This insect was thus determined by Dr. Scudder, but the species is a new one, nearest allied to *palustris*. It has just been described by Prof. Blatchley in his report on the Orthoptera of Indiana as *N. confusus*. I took the true *palustris* for the first time this season in Algonquin Park, where it was found among the sphagnum moss of a floating cranberry bog. You can therefore enter both of these names as Canadian. I also took a pair of long-winged specimens of *Xiphidium saltans*, formerly known only in the short-winged form, in which these organs are very abortive."

One of the most interesting captures made during the past year was that of the large Cockroach *Rhyparobia* (*Panchlora*) *madere*, Fab., which was taken by Mr. Bowman, of Messrs. Bowman & Angeime, in one of their warehouses, at St. John, N.B., and was sent forward by Mr. McIntosh. Mr. A. N. Caudell, of Washington, who kindly named the species states that this large cockroach is becoming quite cosmopolitan but has never previously been recorded from the United States or Canada. It is a large species measuring one inch and three-quarters in length, expanding two and one-half inches across the wings, with a body nearly three-quarters of an inch in width at the widest part; the wings are testaceous, crossed by numerous fine straight lines between the narrow nervures.

DIPTERA

- Culex incidens*, Thoms. Massett, Q. C. I., and Metlakatla, B. C., (Keene); Vancouver, common, Feb'y., (Harvey).
- Culex Fletcheri*, Coq. Regina, Calgary, etc., July, our largest common mosquito, very tawny in colour, (Willing).
- Aedes Smithii*, Coq. Reared from the pitchers of *Sarracenia*, Mer Bleue, near Ottawa (Fletcher, Gibson).
- Symphoromyia cinerea*, Johnson. North of Pincher Creek, N. W. T., July 30, (Willing). Hitherto reported only from New Hampshire, (D. W. Coquillett).
- Stratiomys barbata*, Loew. Victoria, B. C., July, (R. C. Osburn).
- Stratiomys latirentis*, Loew. Rare, St. John, (McIntosh).
- Chrysops hilaris*, O. S. Male and female. This was the first discovery of the male, St. John, (McIntosh).
- Chrysops mitis*, O. S. Vernon, Aug. 14, (Venables).
- Chrysops frigidus*, O. S. Aweme, June 29, (Criddle); Vernon, (Venables).
- Chrysops pertinax*, Will. Vernon, (Venables). No specimen in the U. S. Nat. Museum; it was described from Washington State, (D. W. C.)
- Chrysops delicatus*, O. S. Rare, St. John, (McIntosh).
- Chrysops fulcra*, O. S. Rare, North of Regina, July 1, (Fletcher, Willing).
- Chrysops astutus*, v. d. Wulp. Weyburn, N. W. T., June, (Willing).
- Chrysops proclivis*, O. S. St. John, (McIntosh). Known hitherto from Pacific Coast only. (D. W. C.)
- Silvius giganthus*, Loew. Vernon, (Venables); Vancouver Island, July, August, (Taylor, Harvey).
- Silvius acton*, O. S. Several specimens, July, Aug., St. John, (McIntosh).
- Tabanus epistatus*, O. S. Vernon, Aug., (Venables).
- Tabanus cinctus*, Fab. Aweme, July, (Criddle).
- Tabanus illotus*, O. S. Aweme, June 29, (Criddle).
- Tabanus rhombicus*, O. S. North of Pincher Creek, July 30, (Willing); Aweme, July 6, (Criddle); Vernon, (Venables).
- Tabanus insuetus*, O. S. Aweme, July 9, (Criddle); McLeod, July, (Willing); Vernon, June 27, (Venables).
- Tabanus punctifer*, O. S. Vernon, (Venables).
- Tabanus septentrionalis*, Loew. Aweme, July 11, (Criddle); Vernon, Aug. 5, (Venables); St. John, male not previously known, (McIntosh).
- Tabanus agrotus*, O. S. Wellington, (Taylor).
- Tabanus pruinatus*, Hine. 1 sp. July, St. John, (McIntosh).
- Scleropogon (Stenopogon) inquinatus*, Loew. July 3, Vernon, (Venables).
- Cyrtopogon leucozonus*, Loew. Male, May 14, Vernon, (Venables). Only females in U. S. Nat. Mus. (D. W. C.)
- Pogonosoma dorsata*, Say, Goldstream, V. I., July, (Harvey).
- Gastrophilus equi*, Fab. Vernon, (Venables).
- Gastrophilus nasalis*, L. Maple Creek, N. W. T., Aug. 2, (Willing).
- Eclimys Harrisii*, O. S. Rare, St. John, (McIntosh).
- Systachus candidulus*, Loew. Mount Cheam, B. C., Aug., (Harvey).
- Rhyncophelus Sackenii*, Will. Vernon, June 22, (Miss Venables). Distribution, Illinois to Brit. Col. (D. W. C.)
- Pterodontia misella*, O. S. Wellington, (Taylor).

- Lasiophthicus pyrastris*, L. June, August, Vancouver, (Harvey); Pincher Creek, July 29, (Willing).
- Chrysotoxum pubescens*, Loew. Rare, St. John, (McIntosh).
- Melanostoma Kelloggii*, Snow. 1 sp., St. John, (McIntosh).
- Criorhina nigra*, Will. A few in May, St. John, (McIntosh).
- Criorhina Kincaidi*, Coq. Vancouver, May, (Harvey); Vernon, (Venables). We have only the type specimen, a male, in U. S. Nat. Mus. (D.W.C.)
- Merodon equestris*, Fab. St. John, 1902, (McIntosh). First recorded as found in North America by Mr. Chagnon last year.
- Volucella facialis*, Will. St. John, (McIntosh). Hitherto only known from the Pacific Coast. (D.W.C.)
- Eristalis inornatus*, Loew. Rather common, June, July, St. John, (McIntosh).
- Eristalis flavipes*, Walk. North of Olds, Alta., Sept. 12, (Willing).
- Xylota barbata*, Loew. North Renfrew, B. C., July, (Osborn).
- Myopa clausa*, Loew. Rare, May, June, July, St. John, (McIntosh).
- Myopa plebeia*, Will. Hatzic, B. C., April, (Draper).
- Gymnocheta alcedo*, Loew. Vancouver, May, (Harvey).
- Winthemia quadripustulata*, Fab. St. John, (McIntosh); bred from larva of *Murumba modesta*, Ottawa, (Fletcher).
- Estrophasia clausa*, Br. & Berg. Rare, St. John, (McIntosh).
- Alophora fenestrata*, Coq. A few in August, St. John, (McIntosh).
- Pyrellia cyanicolor*, Zett. Vancouver, April, (Harvey). A rare species.
- Cuterebra grisea*, Coq., n. sp. Fort Simpson, B. C., (Keen).
- Hamatobia serrata*, Desv. St. John, (McIntosh); Regina, (Willing); Vancouver Island, abundant, 1903, (Fletcher).
- Pyrgota valida*, Harris. One pair, St. Catharines, Ont., June 15, (Fletcher).

NOTES ON INJURIOUS INSECTS OF THE ABITIBI REGION.

By TENNYSON D. JARVIS, B. S. A., DEMONSTRATOR IN BIOLOGY, ONTARIO AGRICULTURAL COLLEGE.

Larch Saw-Fly (*Nematus Erichsonii*):—Nearly all of the trees in this northern country have been destroyed by the larvæ of this Saw-Fly. During the early part of July the adult flies were seen floating down the Porcupine River, and a few days later the shore of Nighthawk Lake was covered with them. Pupa-cases were found in masses beneath the surface of vegetation of all the trees examined in the district. The flies deposited their eggs about the first week in July and the eggs hatched about the 12th of July.

Spruce Gall Louse (*Chermes abietis*):—The Gall Louse was very common on the Black and White Spruces. The Spruces along the water seemed to suffer more than the inland trees, and the White Spruce more than the Black.

Birch Case-Bearer (*Coleophora* sp.):—This insect was found feeding on the Paper Birch and Alder. In some districts it was very common and destructive to the Birch.

American Tent Caterpillar (*Clisiocampa americana*):—This pest was found about one hundred miles north of Metagama feeding on the leaves of the Pin Cherry.

Pale Brown Byturus (*Byturus unicolor*):—This pest was found throughout the district feeding on the leaves and buds of the Wild Raspberry.

Pine Borer (*Monohammus confusor*):—A few specimens of this Borer were found, and the work of the insect was noticed in a few places.

American Saw-Fly (*Cimbex Americana*):—The larvæ of this insect were found in considerable numbers on the Willow trees around Nighthawk Lake.

Lace Bugs (*Corythuca arcuata*):—Common on the Birch and Alder through the region.

Spittle Bugs (*Aphrophora* sp.):—Common on the Red Osier, Dog Wood, Spruces, and many herbs.

Cabbage Butterfly (*Pieris rapae*):—The larvæ of this insect were found in the Indian gardens around Nighthawk Lake feeding on turnips and cabbage. The adults were found throughout the Region.

Clouded Sulphur (*Eurymus philodice*):—Adults were quite common around Nighthawk Lake.

Cut Worms (*Hadena* sp.):—Very injurious in gardens at Fort Mettagami, and common in the Abitibi region.

Alder Blight (*Schizoneura tessellata*):—Alders were covered with this insect.

Scurfy Bark Louse (*Chionaspis* sp.):—Found on the Alder at Fort Frederick House Lake.

Ash Colored Blister Beetle (*Epicauta cinerea*):—Were found feeding on the Wild Vetch near Porcupine Lake.

Black Blister Beetle (*Epicauta Pennsylvanica*):—Found feeding on Golden Rod.

Butter-cup Oil-Beetle (*Meloe angusticollis*):—Were found in grass.

Maple Borer (*Dicerea divaricata*):—The adult of this Borer was found in the middle of July around Nighthawk Lake.

The Banded Purple (*Basilarchia arthemis*):—This butterfly was found in open places along river banks.

Yellow Swallow Tail (*Papilio turnus*):—These butterflies were found in the same places as the Banded Purple, and usually accompanied them.

Fall Canker Worm (*Alsophila pometaria*):—Were found on the Birch, Aspen, and many other shrubs throughout the district.

Polyphemus Moth (*Telea polyphemus*):—These were observed floating on the water, and flying around the river banks.

Locusts :—Were common in dry places, but most of them were in the nymph stage.

Tettix sp. :—Were common in wet places and along river banks.

Pine-Cone Willow-Gall (*Cecidomyia strobiloides*) :—Galls were found on the Heart-leaved Willow.

Birch Aphis (*Aphis* sp.) :—Aphids in this country were very uncommon, but Birch Aphids were found in small numbers on nearly all Birches.

Potato Beetles (*Doryphora decem-lineata*) :—A few Potato Beetles were found in the Indian gardens at Fort Mattagami.

Aspen Leaf-Roller :—This insect has caused considerable damage to Aspens in this Region.

Balm of Gilead Leaf-Gall :—This was common on many trees around Frederick House Lake.

HUNTING FOR FOSSIL INSECTS.

By SAMUEL H. SCUDDER.

Fully thirty years ago, the last week of July found my companion and myself in a railway town in Wyoming, camping on the floor of the storage-room of a Western post office and "store" combined, frequented alike by Indians, half-breeds and whites. We had just room to lay ourselves down at night on buffalo robes in the narrow passage between barrels of molasses on one side and cheeses and firkins of pretty strong butter on the other, while skins and furs dangled from the rafters overhead. Sometimes cats entered by the one open window and actually fought on our prostrate bodies, awaking us from profound sleep by squalling in our very ears. Green River served us for our toilet.

We were on the search of fossil insects. A few had been obtained in a railway cutting near by and this indicated that more might be found, as proved to be the case. We prospected at various points in the face of the high red buttes which tower above Green River, and where the thin strata may be traced uninterruptedly for many miles; but at no spot did we discover nearly as many specimens in a given time as at the "Fish Cut," a place across the river two or three miles from the town, where, in making a cutting for the railway many fossil fishes had been exhumed.

To this point, day after day, we went with our satchels, hammers, lunches and canteens, and sat down upon the bank, the walls about us making the July sun still more scorching. There was absolutely no shade, and our only protection was a flat sponge in the crown of our straw hats, parsimoniously wetted now and then from our canteens. The rock here was very hard, and the process of cleaving the shale to disclose the fossils rather trying to the hands, which were well blistered and lacerated after our ten days' work. We obtained a few hundred specimens. Most of them, it is true, were rather imperfect, but fossil insects were a great rarity, and now and then we were cheered by a particularly fine specimen, and renewed our efforts at the precise level at which this occurred. We came to the conclusion that they were mostly found in a small pocket of rock which we exhausted.

Twelve years later, I visited the place again with a different companion. The place was changed, for though there was the same alignment of drinking saloons within quick reach of the station, there was a neat hotel at the station itself, and creature comforts were not lacking. This time we attacked the buttes and especially Pilot Butte on the north side of the railway and were more successful than before, finding many specimens at several horizons, and had the advantage of working a part of the day in the shadow of the butte.

Florissant, in central Colorado, is now the most famous locality for fossil insects in America, and this I have visited at three different times. On the last occasion, having two or three boys with me, we procured a tent, hired a cook, and camped near the little hillock which has

furnished the larger part of the specimens, besides having at one end the huge silicified trunk of a Sequoia tree, which some parties had attempted to saw in pieces to carry off; apparently it proved too severe a task, as the work had been abandoned half finished. Our camp was within pistol shot of this hillock, in a little grove of evergreens overlooking the ancient Florissant lake-basin where the fossils were entombed, and so we could give all day to the work. Moreover, as on previous visits I had made a careful study of the spot and noted the levels yielding best results, little had to be done in the way of prospecting. The pick brought out great slabs which, to uncover the fossils, we proceeded carefully to split with knives and geological hammers, seated side by side in the dirt. In this way we obtained many hundred specimens in a day, while some men set at work in some deeper quarries a mile away brought us at the end of our stay what they had exhumed. Each day's pile was carefully stored in a safe place, and a day at the last given up to packing.

Our cook proved so good in his special line and such a helpful worker with the pick, that we engaged him for the new move the boys were most eager for. Some years before, one of Dr. Hayden's survey parties had discovered in some rocks of about the same age as those at Florissant certain fossil leaves which were identical in species with those found with the insects at Florissant. This was on the summit of the Roan mountains or Book Cliffs, distant some two hundred miles, but still in Colorado. From that point, moreover, it was but thirty miles in a direct line across the mountains to a place where fossil insects themselves had been found in the valley of the White River, though nobody had been able to rediscover the precise locality, and the original explorer was dead. That it was beyond the settled country only excited the enthusiasm of my companions, and so our pecking party around the Florissant hillock spent much time in planning the expedition we finally undertook.

This was in 1889. We made our way to Grand Junction by rail and there procured a simple "outfit" in the shape of a two-horse team, an extra horse and saddles. Our cook was our teamster, and loaded with provisions we pushed out from Grand Junction late in the afternoon of July 12th and camped by the roadside twelve miles on, passing Fruita on the way. By noon of the next day our road left Grand River and headed for the mountains and we reached the last ranch in Salt Creek by nightfall. The close of another day, in which we passed a band of Utes, found us camped in the woods on the summit of the Roan mountains by Cliff Springs, a meagre enough trickling affair, but the only water for miles about.

Here we spent a week, discovered with little doubt the spot where the fossil leaves had been found, but with them no insects. At several other points however, and especially at one place about five miles from camp, we found an exceedingly rich deposit of insects, very easily worked. This locality was a charming one. At the height of nearly nine thousand feet and at the very brink of a precipitous descent of more than two thousand feet, one looked beyond the deeply cut ravines to the distant plains, through which the Grand River forces its way. We had to work on the slope of the precipice, cutting footholds for our security from slipping. We had also to walk back to camp, using our beasts as pack animals and following the Indian trail along the brink of the precipitous cliff; at times this passed through a dense chapparal, where it was difficult to get through without unlading, or injury to our treasures; at others it ran a little below the brink of the precipice along the talus by a scarcely marked path, where the rubbish loosened by our tread rolled and fell, many hundred feet below. Once, in the most critical spot, a violent storm of hail struck us and whirling about with no regard whatever to our shelving footing, the animals all turned tail to the wind like weathercocks, facing down hill, and nearly set us rolling down the steep embankment; nor would they budge till all was over.

We were shortly visited at our camp by some of the Utes, including the Indian Police, suspicious of hammers and picks in such close vicinity of the Indian reservation, still more

suspicious when they learned our intention to enter it. But they were probably appeased on sight of the fossils, for they did not visit us on the Reservation, though we told them just where we were bound.

After a week's stay, living largely on venison and nightly visited by skunks and other prowlers, including one bear, we cached our fossils, and made our next move of forty miles to the White River by way of Douglas Creek. We had for company a team of road-makers, who had been camped near us. There was one ranch and a well of water at a point about midway, where we camped the first night. For myself, armed with hammer and insect net, I walked alone the rest of the journey, meeting not a soul, and shall never forget that broiling, breathless valley. I found just one bit of shade the entire distance by hugging a huge rock, and here I stripped to the skin to bathe in the air, the only element at hand, and then pushed on, inspired by the thought of a coming plunge in the White River.

At Rangeley, where we struck the river, were, within a radius of a couple of miles, four or five ranches, a school house and a postoffice, visited twice a week by a post rider from the nearest station, sixty miles away. Here we rested a couple of days, restocked our larder, and then pushed down the river to the Utah boundary and Reservation. The road, if road it could be called, where no teams passed, was of the roughest, and we all had literally to put our shoulders to the wheel to get past difficult places, or to prevent an upset. At the end of two days' journey we found by the river bank a winter camp of herdsmen, now deserted, and took possession, though we slept in the open.

Here, in the course of a fortnight or more, we explored the region for ten miles around, varied by an occasional irruption of cow boys in search of vagrant cattle, and willing to play a trick or two on "tenderfeet." We were more than a dozen miles beyond the last ranch and had the world to ourselves. We bathed in the coffee-colored White River morning and evening, but the day was given up to exploration and quarrying in the hot August sun. The superb frowning cliffs enticed us in every direction, and we found fossil insects at a dozen different points, and at many horizons of the varicolored strata. We pushed our way into most of the burning side canons but, as it was hot enough elsewhere, merely looked into "Hell Hole." Our most successful quarrying was on the very top of one of the highest bluffs, fully a thousand feet in height, up which we had not only to climb by a precipitous talus heap, but drag a horse after us, laden with our lunch and a keg of water. The water was turbid enough, and our only lunch cold oatmeal and sugar, the cooked oatmeal of a muddy color from the impurity of the water. All specimens had to be wrapped and carefully packed in satchels for the descent. But we succeeded in our search, found large slabs quite covered with insect remains, and brought away many hundreds of fossils, and finally a large experience of roughing it in the West.

Our horses barely dragged our laden wagons back to Grand Junction, one of the party, taken down by illness during our halt on Roan Mountain, having to lie at full length all the way over the rough roads in the springless wagon. As a result of this six weeks' trip we discovered that fossil insects can be found at two additional places in Colorado, as abundantly as at Florissant. No doubt there are many other places awaiting discovery.

RECOLLECTIONS OF THE PAST.

BY J. ALSTON MOFFAT, LONDON, ONT.

It has been remarked that it is a certain indication of persons getting old when they become reminiscent. The recent death of Mr. James Angus, of West Farms, near New York, who was for thirty-two years a member of the Entomological Society of Ontario, turned my thoughts backward upon many things, and as there is no question now as to my being old, it

will be quite in harmony with my condition to indulge a little in what is regarded at that time of life as an excusable natural propensity.

My acquaintance with Mr. Angus was brought about through a somewhat peculiar chain of incidences that will require relating.

Living in Hamilton at the time, and having turned my attention to the collecting of insects as a recreation in ill-health, having all my life been afflicted with a feeble digestion, I found it necessary to avoid business in order to secure some prospect of recovery. And as idleness was misery to me, I found collecting insects such a congenial occupation that it soon claimed my whole attention. Having discovered that cider was to me an aid to digestion, I one day came upon a person who was disposing of cider in small quantities, and made arrangements with him to supply me regularly. After we became acquainted he informed me that his name was George Anderson—that he lived for some time in the neighborhood of Providence, Rhode Island, and had been gardener for a man of means there, who at the outbreak of the Civil War had to close up his establishment in order to curtail expenses. So Mr. Anderson had moved to Canada, purchased land on the opposite side of the Bay from Hamilton, part of an estate called "Oaklands," and was then engaged in market gardening on his own account. He also informed me that he was well acquainted with a family in Providence of my name, and was wondering if we might not be related. I told him that I was too young when brought to this country to know much about my relatives there; but I had heard that some of my father's folks had moved to this side of the Atlantic, but where they were located I did not know. Nevertheless, if there was any connection between us, there would be no difficulty whatever in tracing it: as my father had a brother in Glasgow who was well known, Dr. William Moffat, who had served as a surgeon under Wellington during the peninsular war, and had attained some fame. Mr. Anderson laughingly remarked that he had often heard them speak of "their uncle the Doctor," as Mrs. Anderson came from Glasgow and knew the Doctor, consequently he was a frequent subject of conversation between them. Dr. Moffat had become a Baptist, and attended the same church as Mrs. Anderson and her people went to and was in the habit of regularly addressing their church meetings. Thus a friendship was established between Mr. Anderson and me. He invited me to visit his place and make the acquaintance of Mrs. Anderson, which I gladly accepted, it being just a pleasant walk round the head of the Bay from Hamilton, during which I could do a little collecting by the way. Then, when Mr. Anderson learned that I was engaged in collecting insects, he informed me that he had a brother-in-law in New York, who was a collector and had an extensive collection, James Angus by name, a brother to Mrs. Anderson, and thus I first learned of Mr. Angus. It was not long before Mr. Angus heard of me through Mrs. Anderson, he having a great admiration of Dr. Moffat in religious matters. And here I may introduce an incident of quite recent occurrence.

Whilst looking over the list of members of the Philosophical Society of Glasgow for the year 1901, my eye rested on "J. Carfrae Alston." Thinking it was likely that I had many relatives of that name in Glasgow, I became curious to know if he might not be one of them, and as his address was given I thought I would make bold to enquire. So I wrote to him, stating how I had come by his name and address, and that my curiosity had been excited to know if we were connected, and he being a member of a similar society an interchange of thought might not be objectionable, and if there was any connection it could be easily determined, as my mother was a sister of the late John Alston, of Rosemount, more generally known as Bailie Alston, who took a deep and active interest in the Royal Glasgow Asylum for the Blind, and had the Bible printed in raised letters for their use so that all could read. A marble bust of him stands in the main entrance of the institution as its most eminent benefactor, with other means of identification.

In due time I received an acknowledgement from C. S. Alston, stating: "Your note of 21st January last, addressed to Mr. J. Carfrae Alston, has been handed to me for perusal and reply, as Mr. Carfrae Alston is quite unaware of the Moffat connection. Mr. J. Carfrae Alston is a son of the late Thomas Alston, the second son of the late Bailie John Alston, of Rosemount, who died some fifty or sixty years ago. He is a very busy man, who takes a deep and lively interest in the philanthropic work of our great city, and is held in much estimation by his fellow citizens.

"I have a faint recollection of your people, who were in business on the High Street of Glasgow. Also of your uncle, Dr. William Moffat, whose surgery was on the same street, and who I was told had held the post of Surgeon-Major in the Army under the Duke of Wellington, was taken prisoner by the French, but afterwards made his escape from a prison in Paris by getting into and passing through a common sewer into the River Seine and reaching the hands of his friends after many difficulties." Mr. C. S. Alston further adds: "I may state that I am the son of a half-brother of Bailie Alston, and lately retired from the Governorship of Glasgow Prison, after a service of forty-four years between the County of Lanark and the Government."

This Bailie Alston must have been a man of taste, with a strong inclination towards natural history subjects, as well as being of a philanthropic turn of mind. Every time I visited Rosemount with my mother or my eldest sister, I seem to have received a fresh impression of something that I saw there that has endured to the present. An extensive garden, planned to show to the best advantage the gardener's art: much shrubbery and many winding paths, in turning which you obtained a different view of the brightly colored flowers in the many beds of various forms. A greenhouse against the side of the kitchen; and behind the receding shelves upon which the flower-pots stood was an aviary, in which was a diversity of native singing-birds, bright and lively—a source of unfailing wonder and delight to me. A high stone wall enclosed the premises, as was the fashion of the times, with ornamental gates in front. In the wall at the back of the garden was a door, which was used as a short cut in that direction. Over the pathway leading to this door a whale's jaw had been set into the ground, and formed an arch under which one had to pass when going out of that door; and I remember the awe with which I surveyed that arch, and wondered at the hugeness of the animal that had owned it.

But that which has retained its interest for me through all these years was an experience which the Bailie was engaged in carrying out with a living toad. He had no doubt read, as probably all of us have done many times since, of toads having been found alive in solid rocks, living trees or great depths of soil; where, if we are to believe the tales they must have remained in a dormant condition for long periods of time, some of them counted by centuries, without light or food. And he seemed to have undertaken the task of proving to some extent, the powers of endurance possessed by a toad for a long period of successful hybernation; so as to test to that extent the reliability or otherwise of these newspaper stories, exhibiting a decidedly practical turn of mind, combined with true scientific exactness. What appeared to be a full grown toad had been procured, placed in a flower pot half filled with soil. The pot covered with a piece of slate, then all buried a good depth in the ground, to be taken up and examined once a year, and repeated for ten years if the toad survived.

I was fortunately, but quite accidentally, present at the third annual opening and exposure of that toad to view—a boy of eight or nine years at the time. A company of interested persons had been invited to be present on the occasion. A wide circle was formed round the locality, which was in a well kept lawn. The gardener, who knew the spot, unearthed the pot, lifted it out, took off the slate and exposed the toad. It was in but not under the soil, appeared to be sound asleep and shewed no indication of wasting from want of food. After a little while of exposure it gave signs of life, straightened its front legs, opened its eyes, and

seemed to be getting ready to make a jump, when the slate was put on and pot and toad buried for another year.

I have always had a desire to know what was the result of that experiment, as a mystery of great interest surrounds the hibernation of animals, that can be satisfactorily cleared up only by such a method of investigation. And I had great hopes of obtaining some further information about it from Mr. C. S. Alston, and referred to it in one of my letters to him ; but all he said in reference was, "I have often heard my father speak of the toad in the hole." And now that he is gone, possibly all knowledge of the transaction is forgotten.

Some animals seem to be capable of entering into a comatose condition at pleasure ; others, only when constrained by external conditions. Hibernation may be either partial or complete. In the case of the mammalia hibernation is only partial, as respiration and circulation are not wholly suspended : the creature coming out of that state in a greatly reduced and exhausted condition, proving that a prolonged period of time in that state beyond what is usual to it, would certainly end fatally with it. In the reptilia the case is different. When they go into hibernation it is complete, respiration and circulation being totally suspended, and therefore there is no wasting of their substance, giving good reason for the belief, that under suitable conditions, they might remain in that state indefinitely and come out alive, with sufficient vigor to enable them to fulfil the functions of their life as if nothing unusual had occurred to them, thus lending support to the wonderful stories that have been put in circulation about them ; and that there may be after all some truth in them.

In entomology, the internal and external influences at work in producing hibernation, partial or complete, are about as various as the life histories of the species indulging in it. And very little careful investigation has been made to discover the powers of endurance that may be possessed by any of them to resist a prolonged period of suspended animation without injury. Accidental observations have been made which prove that some species are capable of enduring a period of hibernation far beyond what is usual with them, and come out of it with their powers unimpaired by it. Herein we have an important matter for scientific investigation. In view of the fluctuation of temperature on the earth's surface since life appeared upon it, the advantages to any species possessed by such powers, must indeed have been very great. It would enable it to go into a state which would in a measure make it oblivious to the adverse conditions surrounding it, which otherwise would have exterminated its species, thus placing it in a position when circumstances were again favorable for propagating its kind, to continue its career and thus affect in a marked degree its distribution on the face of the globe.

When I got into communication with Mr. Angus at first, he was engaged in making a collection of *Catorala*, of which he ultimately secured, by purchase or exchange, one of the largest and most complete collections of his time. His ambition being to have every known species and variety represented in it. Hamilton was particularly rich in this attractive genus, and the late Mr. William Murray turned his attention almost exclusively to it for a time, and supplied Mr. Angus with many specimens that he was then in want of. Mr. Angus, having become an expert in the nomenclature of the genus, rendered us much service in naming our specimens.

There were to be found in the neighborhood of Hamilton about twenty species that might be fairly pronounced abundant, and some of these had their varieties in goodly numbers associated with them. Then there were eight species that were considered as rare. Our favorite and most productive hunting ground for *Catorala* was what has been more recently known as the Asylum Woods. Only at that time the Asylum had not come into existence, so it was designated after its nearest resident neighbor. It was an extensive bit of virgin forest, composed of large oaks, hickory, beech and maple, with very little under-brush, an ideal day-

light hunting ground. Having discovered that perfect specimens of *Catocala* were not to be secured by the use of a net, they being so strong of wing and loose in scale, one flutter in the net would leave the thorax naked and ruin the specimen; so we would examine the tree and discover, if possible, the moth asleep on its bark, place a poison bottle over it, slip a card between the bottle and the tree, and a few flutters on the smooth glass did it but little injury. But most of them preferred resting upon oak trees, whose bark they resembled so closely that it was impossible to detect all of them. So a switch was rubbed on the tree to start those overlooked, and they were followed up to the next tree they would alight upon. Then a process of "Stalking" had to be indulged in, as each time they were disturbed they became more wary. This method of collecting in day-light affords an opportunity for studying their habits not obtainable at sugar or light. Their general mode of flight is a rapid, jerking, zig-zag movement, with various degrees of intensity in the different species, which makes it difficult to follow them with the eye. Some kinds, when disturbed, would alight upon the nearest tree plainly in sight, whilst others would disappear in the distance, and others again would vanish behind the nearest tree. Some would alight higher up every time they were disturbed, soon putting them out of reach, whilst *Obscura* would alight at the root of a tree or even on the ground. *Catocala* mostly rest with their heads up, but there are species which rest with it down. I have seen them alight head up, then prepare themselves for another rest by turning head downward. *Amica* would often move a few inches to one side on the same tree, and I have thus followed them until they had encircled the tree. *Catocala* are extremely sensitive to changes in the weather. On a fine warm day, they may be in profusion; on the next, in the same locality, with an east wind, there will not be a specimen observable. What became of them or where they hid themselves, I could never learn. One very warm afternoon, I saw *Paleogama* flying about the woods and apparently pursuing one another in a sportive mood like butterflies. They might have been taken with a net by the dozen.

The species that were most plentiful and that could be depended upon to appear more or less numerous every season were: *Retecta*, *Obscura*, *Relicta* with its variety *Bianca*, *Amatrix*, *Cucumbens*, *Unijuga*, *Briseis* with its variety *Semirelecta*, *Meskei*, *Parta*, *Ultronia*, *Ibia* and its variety *Uxor*, *Innubens* and its variety *Scintillans*, *Cerogama*, *Neogama*, *Subnata*, *Patrie*, *Paleogama* and its variety *Phalanga*, *Habilis*, *Polygama* and *Amica*, with *Parthenos* *Nubilis*. The rarer species, that is, such as we never got all that we want of them, indeed some of them taken only in single specimens of their kind were: *Epione*, *Pesperata*, *Insolabilis*, *Lerettei*, *Cara*, *Coccinata*, *Serena*, *Clintonii*. All of these, with the exception of *Meskei* which was extremely local in its habits, I have taken in the vicinity of Hamilton. I also took a single specimen of *Elonympha* at Ridgeway, the only one as yet reported to my knowledge that has been taken in Canada. Mr. James Johnston has recently added *Robinsonii* and *Nebulosa* to the Hamilton list.

Mr. Angus never associated himself with any of the New York Entomological Societies, and the reason which he gave to me for it was that they usually held their meetings on Sundays which he did not approve of, he having received in his youth a strict Scottish education on this subject, which gave him a strong regard for the sacredness of the day. So his extensive information upon entomological subjects seldom got beyond his own private circle, which might have been different if he had been more congenially situated. Mr. Grote speaks of him in the Annual Report of the Entomological Society of Ontario for the year 1888, page 62. As one of those that were attracted to him for information upon Entomology, at a time when Mr. Grote was the leading authority on North American Noctuidæ, and he must have been impressed with the appearance of the man, as he remarks upon him as a tall Scotchman with curious, white and black in bunches, parti-colored hair, very intelligent, kindly but reserved. By the time I met him, his hair had become all white, his reserve was not

conspicuous, but his kindly intelligence was very noticeable. He visited Mr. and Mrs. Anderson at their Oakland residence while I was living in Hamilton; so I had the pleasure of meeting him upon several occasions and found him to be a very pleasant and profitable guide upon a collecting excursion. He was in the habit of observing every branch of Entomology and had a general knowledge of its various departments. He called my attention to two species of Ladybirds which were rare with him and which I had not observed before, *Coccinella transversoguttata*, Fab., and *monticola*, Muls. They were at the time in great numbers upon Mr. Anderson's strawberry beds, but I have never seen them in any numbers since. It seems to be a habit with ladybirds for one species to appear in profusion during one season, to the almost complete exclusion of all the others. Then another species will be equally plentiful another season, but never the same species in unusual numbers for two years in succession, which seems to be rather odd and requires some explanation. I have seen this occur with species that are by no means rare, such as *trifasciata*, *bipunctata*, *pullata* and *15-punctata*. On one occasion, when I was visiting in the country for a few days, where they were drawing in peas, I saw the barn floor covered half-an-inch deep with a living mass of *H. parenthesis*, and hardly another species was to be found amongst them. I have observed another curious habit of some species, in their larvae gathering together in clusters on the trunks of trees to pupate. I have come upon many such clusters in different years, and they were mostly on Basswood trees.

During the time of that visit by Mr. Angus, Thistle butterflies were unusually plentiful about Hamilton, and he took great pleasure in looking at them as they swarmed over the clover fields, and expressed the opinion that he had never before seen that butterfly so large in size and rosy in color. It was about the time that he made over his Entomological Collection to the New York Museum, and as a natural result, began to feel less interest in Entomology, so to occupy his time he commenced collecting Indian relics, which he thought would be more suitable for him at his time of life.

REV. GEORGE WILLIAM TAYLOR, F.R.S.C, F.E.S., F.Z.S.

The readers of our Report and of *The Canadian Entomologist* will be pleased, we feel sure, to see the good portrait given herewith of the Rev. G. W. Taylor, who during the last twenty years has done such excellent work in almost all lines of natural history in British Columbia. Born in 1854, in Derby, England, where he received his education, Mr. Taylor, after leaving school, studied mining engineering, but in 1882 came out to Canada and went direct to British Columbia, where he had relatives. Although engaged for a short time in farming, he began almost immediately to study for the ministry and in 1884 was ordained by the Bishop of Columbia. Since that time, with the exception of two years, from September, 1888, to August, 1890, which he spent in Ottawa as Rector of the joint parishes of St. Barnabas and Holy Trinity, he has been in charge of parishes in British Columbia, and at the present time is Rector of the Anglican Church at Wellington, B.C. From boyhood Mr. Taylor has been keenly interested in natural science and has from his enthusiasm and industry accomplished much, not only in doing original work of importance in several lines of zoology and paleontology, but in constantly encouraging and assisting others with whom he came in contact to take up and enjoy with him his favorite studies. Mr. Taylor has for many years been a Fellow of the Entomological and Zoological Societies of London, England, and in 1884 was elected a Fellow of the Royal Society of Canada in recognition of his eminent services to science, particularly in connection with his investigations in Canadian Conchology and Entomology. In 1887, Mr. Taylor was appointed Honorary Provincial Entomologist of the British Columbia Department of Agriculture and sent out a circular letter to farmers drawing their attention to the losses due to

insects and asking their co-operation. Owing to his removal to Eastern Canada in 1888, this work was relinquished before any report was issued. Several important papers have appeared from his pen in the Transactions of the Royal Society of Canada, *The Canadian Entomologist*, *The Ottawa Naturalist* and *The Nautilus*. Many new species have been discovered by this energetic worker, and several have been named after him. Among insects, species which have been mentioned in *The Canadian Entomologist* are *Melitea Taylori*, W. H. Edwards; *Anthelia Taylorata*, Hulst; *Ichneumon Taylori*, Harrington; *Trichiosoma Taylori*, Provancher; and *Adranes Taylori*, Wickham. All orders of insects, however, have been studied, and several other species in different orders from those named, have been or are being named after the subject of our sketch. Some of Mr. Taylor's best work has been done on the Mollusca, and naturally several new species have been described after him. Names which occur to us are *Pristoloma Taylori*, Pilsbury; *Modiolaria Taylori*, Dall; and *Phyllaphysia Taylori*, Dall. In addition, a new species of sponge, *Leucandra Taylori*, Lambe, may be mentioned.

Enormous and valuable collections of British Columbian specimens of various kinds have been made and generously sent off to collectors in all parts of the world. Mr. Taylor possesses himself the largest private collection of Limpets (Patellidæ and allied families) in the world, also the most complete collection of Unioïdæ in Canada, and one of the largest general collections of land and water shells (7,000 species) in Canada.

A constant collector of insects, Mr. Taylor has also amassed valuable collections of insects in several orders, notwithstanding the fact that he has made a practice continually of giving away to specialists any specimens from his own collection, which were required for study. His cabinets contain a wealth of representative specimens of inestimable value to the many beginners who have been stirred up by his enthusiasm to investigate the insect fauna of our Pacific Coast Province. At the present time he is devoting all his energies to the working up of the North American Geometridæ, paying particular attention to northern species which are likely to occur in Canada. Since the death of the Rev. Geo. D. Hulst, this important family of moths had been somewhat neglected by American students. Mr. Taylor's methods of work are systematic and thorough. First reviewing all the literature of the subject under consideration, he then strives to acquire types for study from the original localities, compares these with the descriptions and then with extensive series of specimens from as wide an area as possible. Mr. Taylor is an indefatigable collector and a generous correspondent, who considers no trouble too much to make observations or secure specimens when specially desired. In his parish work he is painstaking, gentle and self-denying—always ready to help. A clear and forcible preacher and an earnest liver who shows in his works that religion is not an accessory of every day life but an integral part of it.

J. F.

PROFESSOR AUGUSTUS RADCLIFFE GROTE.

It is with profound regret that we record the death of our greatly esteemed friend, Professor Augustus Radcliffe Grote, A.M., which took place at Hildesheim, Germany, on Saturday, September 12th, where he had been living for the last nine years, after a residence at Bremen of a somewhat longer period. Not long before his departure from the United States for Germany he sent to Dr. William Saunders, at that time editor of the "*Canadian Entomologist*," some particulars of his early life, which will, no doubt, be of much interest now.

He was born at Aigburth, a suburb of Liverpool, England, on the 7th of February, 1841. On his mother's side his grandfather was the late Augustus Radcliffe, a partner in the house of Sir Joseph Bailey, a Welsh iron-master; his mother was a cousin of Mrs. G. M. Boswell, wife of the well-known Judge Boswell, of Cobourg, Ontario, and of the Radcliffes, who formerly lived in this Province, and in the Isle of Wight, England; he was a first cousin also of Ethel Duncan, the wife of the late Professor George Romanes, F.R.S.

On his father's side the family traced their descent to Hugo Grotius, the Dutch writer and author of *De Veritate Religionis Christianae*, a theological text-book familiar to students a generation ago. His father, who was born at Dantzic, in Prussia, where his half-brother was Director of the Royal Academy, and a painter and etcher of eminence, was an only child by the second marriage of his mother; she was the daughter of a Lutheran clergyman, who at the time was the highest ecclesiastical dignitary in Dantzic. The family name was originally written "Grohtë," and was changed to "Grote" by Act of Parliament, when the Professor's father became an English citizen. At the early age of seven our friend came to New York, following his parents, who had made the voyage the year before, and had now decided upon taking up their abode in the United States. His youth was passed on Staten Island, where his father had bought a large farm, and becoming interested in real estate conceived the idea of the Staten Island Railway, of which company he was the secretary and treasurer during the period of its construction. The commercial panic of 1857, and the resulting depression of business threw the enterprise into Mr. Vanderbilt's hands, and Mr. Grote's real estate investments turned out disastrously. Meanwhile young Grote had been preparing for Harvard University, but was obliged by the straitened circumstances of the family to abandon his prospective career; later on he was enabled to go to Europe and completed his education on the Continent; after his return he received the degree of A.M. from Lafayette College, Pennsylvania.

From his earliest years Prof. Grote was a student of nature, and his delight as a boy was to roam through the woods and over the upland meadows of Staten Island. In his "Hawk Moths of North America" he describes the joys of these rambles; "the early dawn," he writes, "is a profitable time for the collector of lepidoptera, who may then surprise the moths on their first resting places after the fatigues of the night. On Staten Island my early rising was rewarded by many captures at the hour when the cat bird sings and betrays to none but chosen ears her relationship to the many-tuned mocking bird of the south." Again, "collecting at night has the drawback that one never knows when to stop and go home to bed, seduced by the mysterious silence and shadowy vistas in the woods. Even when the moths will no longer come to bait, one lingers, waiting for some revelation. The moon has transformed the prospect, and in its weird light an uneasy spirit seizes one to adventure farther yet. . . . Thus certain hours and places, lanes along which the green tiger beetle flew up ever and anon before my boyish feet, marshalling the way that I should go, come back to me again out of the years of my early studies, intoxicating my memory. Poe says that joy is not gathered twice in a life, as the roses of Pæstum twice in a year. But I gathered then so much that it lasts until now, when world-griefs hold me fast."

At the age of twenty-one Prof. Grote published his first papers on new species of Noctuidæ in the Proceedings of the Academy of Natural Sciences and of the American Entomological Society of Philadelphia, and soon after he corrected the proofs of his friend. Dr. A. S. Packard's paper on United States Bombycidae, while the author was absent at the seat of war in the South. From 1862 his contributions to Entomological literature succeeded each other rapidly, and by the time he left America for Germany he had described a very large number of genera and species, and was justly regarded as our chief authority on the nocturnal Lepidoptera of North America.

In 1880 Prof. Grote married a grand-daughter of Judge Johnson, of Charleston, S.C.; she died in Alabama on the birth of his second child after three years of happy married life. It was fully ten years later when, in Germany, he was married a second time to Fraulein Minna Ruyter, who, with several children, now survives him.

During his residence in Alabama, Prof. Grote studied the cotton worm, and brought the subject before the public in a lecture; he then went to Washington and tried to interest the

Government in the matter, but without success. Subsequently "The Entomological Commission," consisting of Messrs. Riley, Packard and Thomas, was appointed by Act of Congress, and Prof. Grote was keenly disappointed at his failure to obtain a place upon it; this failure he, rightly or wrongly, attributed to the adverse influence of Dr. Riley, and for many years he took every opportunity of criticizing in vehement language the work of this distinguished Entomologist. He was, however, employed by the Commission in 1878 to visit Florida, Georgia and Southern Alabama for the purpose of investigating the insects injurious to the cotton plant, and especially to make observations upon the supposed migrations of the moth. His brief report is incorporated in the large volume published by the Commission in 1885.

Early in 1873, in consequence of the loss of his wife, he left Alabama, and removed to Buffalo, N. Y., where he became curator of the Buffalo Society of Natural Sciences, and began the publication of its Bulletins, to which he contributed the larger proportion of the articles. In 1878 his reputation as an Entomologist had become so assured that he was elected Vice-President of section B of the American Association for the Advancement of Science, and delivered his address at St. Louis on the subject of "Scientific Education." In 1879 he began the publication of a monthly magazine, "*The North American Entomologist*," but the venture did not prove successful, and was abandoned after the issue of a single volume. During his residence in Buffalo he delivered a number of lectures on various subjects, many of which were published in the *Scientific American* and the *Popular Science Monthly*; he also wrote many essays and a philosophical book, "The New Infidelity," subsequently translated into German, which (to quote his own words) "met with warm praise and severe criticism, but enjoyed only a small sale." In 1832 he had published in London, England, a volume of poems collected from various periodicals to which he had contributed them; the principal poem dealt with the ghost theory in evolution, and was favorably reviewed by Mr. Herbert Spencer. The versatility of his talents was further shown by his devotion to music; while in Buffalo he was organist of one of the principal Episcopal Churches, and subsequently composed many pieces of music, one of which only was published, and even attempted the composition of two operas, which, however, he found too great a task and never completed.

Owing to the death of his father he left Buffalo and returned to his old home on Staten Island. There he remained for a few years only and then left for Europe, where he spent the remainder of his days. His large collections of North American Lepidoptera were sold to the British Museum, where his failure to obtain a position on the staff caused him keen disappointment. For ten or eleven years he lived at Bremen in Germany and then removed to Hildesheim, where he spent the last nine years of his life in the congenial position of honorary assistant in the Roemer Museum. During all these years abroad he was by no means idle, but continued to contribute to several periodicals in North America including the "*Canadian Entomologist*," and to publish numerous essays both in English and German of a high scientific value, and many of them dealing with abstruse philosophical questions.

We may now turn to his connection with our own Society. As long ago as 1868, he was elected an Honorary Member in company with such distinguished Entomologists as Drs. Leconte, Horn and Packard, Messrs. Scudder, Riley, Edwards, Cresson and Glover. Our association of him with these eminent men is a sufficient proof of the estimation in which we held his scientific attainments at that time. His contributions to the *Canadian Entomologist* began with its second volume in 1869 and continued with little intermission down to the present time; in fact the editor has still in his hands several papers sent in by Mr. Grote during the last few months. These articles must number several hundreds, and they were supplemented by some longer, very interesting papers published in these Annual Reports. An excellent likeness of him appeared in the issue of the *Canadian Entomologist* for January, 1895, and in the 25th Annual Report for 1894.

Prof. Grote paid two visits to London in 1876 when he went over the Society's entire collection of Lepidoptera in order that the specimens might be accurately named before transmission to the Centennial Exhibition in Philadelphia, which was held that year. He also, when living in Buffalo, assisted many of our members in the determination of their moths and spared no pains in this laborious work, considering himself well repaid by the occasional discovery of a new species.

The name of Prof. Grote will long be held in honor by those who knew him personally or through correspondence; it will also go down to posterity attached to the specific and generic names of many hundred moths of which he was the original describer. In common with all other human beings he had his weak points and thereby incurred the animosity of some against whom he would vent his wrath in no measured terms; but to most he was kindly and genial, always ready to help where he could, and to his intimate friends warmly affectionate even after long years of separation.

We may fitly close this sketch with the following quotation from one of his own essays: "Even in comparatively so small a social field as Entomology affords, the man of science may oppose the purely selfish action, the insincere statement, and try to correct the limited experience which prompts so many faults. From the contemplation of much that is paltry and much that is stupid in the writings and doings of Entomologists, he can at least always turn for relief to Nature herself, standing high above all the schools which strive but to translate her. He may drink in all the loveliness of the world and refresh his soul by wanderings in field and forest, by expansive lake and winding stream. And, when the summer is past and the roses, by thousand ways and voices Nature will still amuse him, until tired of the quest, he falls into the last sleep in the arms of the universal mother."

C. J. S. BETHUNE.

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Fordyce Guine

THIRTY-FIFTH ANNUAL REPORT

OF THE

Entomological Society

OF

ONTARIO

1904

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.)

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO



TORONTO:

Printed by L. K. CAMERON, Printer to the King's Most Excellent Majesty

1905



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1905



WARWICK BRO'S & RUTTER, Limited, Printers
TORONTO

TO THE HONOURABLE WILLIAM MORTIMER CLARK, K.C.,

Lieutenant-Governor of the Province of Ontario.

May it please your Honour:

I have the pleasure to present herewith for the consideration of your Honour the Report of the Entomological Society of Ontario for 1904.

Respectfully submitted,

NELSON MONTEITH

Minister of Agriculture.

TORONTO, 1905.



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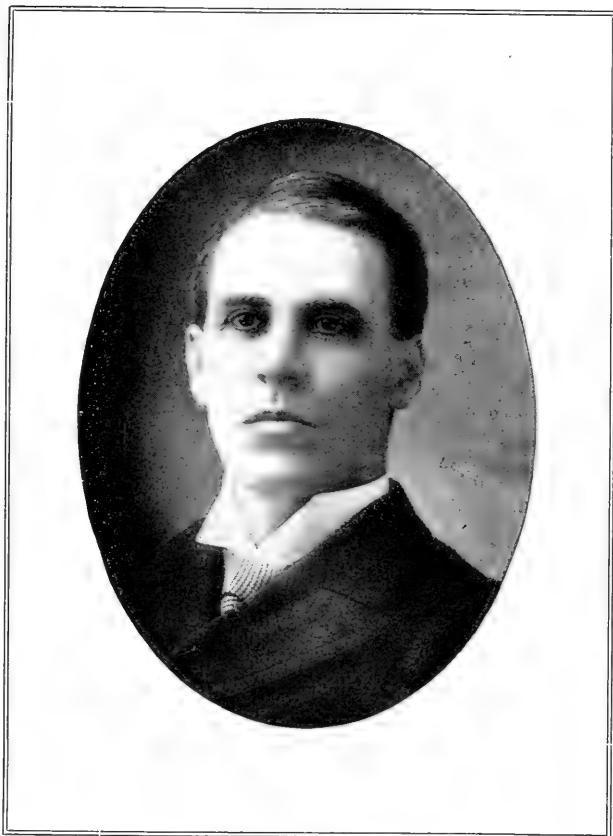
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Robinson, T. S.	Ouïremont.
Roy, Rev. Prof. Elias	Levis.



WILLIAM LOCHHEAD, B.A., M.SC.

PROFESSOR OF BIOLOGY AND GEOLOGY, ONTARIO AGRICULTURAL COLLEGE, GUELPH
PRESIDENT OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO, 1902-4.



THE LATE JOHN ALSTON MOFFAT.

LIBRARIAN AND CURATOR, ENTOMOLOGICAL SOCIETY OF ONTARIO, 1890-1904.

THIRTY-FIFTH ANNUAL REPORT

OF THE

Entomological Society of Ontario

1904.

To the Honourable the Minister of Agriculture:

SIR,—I have the honour to present herewith the Thirty-fifth Annual Report of the Entomological Society of Ontario, which contains the proceedings of the Forty-first Annual Meeting, held at London on the 26th and 27th of October, 1904. The report includes the papers read and the reports submitted by the various Officers, Sections and Branches of the Society.

The Canadian Entomologist, the monthly organ of the society, has been regularly issued during the past year and has now completed its thirty-sixth volume, which has fully maintained the high scientific standard of its long series of predecessors.

I have the honour to be, Sir,

Your obedient servant,

CHARLES J. S. BETHUNE,

Editor.

London, Ontario.

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Division No. 2—C. E. Grant, Orillia.
Division No. 3—J. B. Williams, Toronto.
Division No. 4—G. E. Fisher, Burlington.
Division No. 5—S. B. McCready, Guelph.

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Auditors—W. H. Hamilton and F. A. Stuart, London.

Editor of the "Canadian Entomologist"—Rev. Dr. Bethune, London.

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THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

ANNUAL MEETING.

The Forty-first Annual Meeting of the Entomological Society of Ontario, was held in London, on Wednesday and Thursday, October 26 and 27, 1904. The chair was taken by Professor Wm. Lochhead, of the Ontario Agricultural College, Guelph, President. Among the members present were Dr. James Fletcher and Mr. Arthur Gibson, Central Experimental Farm, Ottawa; Mr. H. H. Lyman, Montreal; Mr. C. H. Young, Hurdman's Bridge; Mr. J. D. Evans, Trenton; Mr. J. B. Williams, Toronto; Mr. G. E. Fisher, Burlington; Rev. Dr. Bethune, Dr. Woolverton, Profs. Dearness and Bowman, Principal Merchant, Messrs. Balkwill, Bock, Law, McCready, Saunders, Thompson, Westland and others, London; Miss Dunlop, Woodstock. The Society was also favored with the presence of Prof. H. F. Wickham, of the University of Iowa, Honorary Member of the Society; Mr. T. N. Willing, Government Inspector of Weeds and Insects in the Northwest Territories, Regina; and Prof. Creelman, President of the Ontario Agricultural College.

During the morning of Wednesday, Oct. 26th, a meeting of the Council was held. The Treasurer's report was discussed and gratification was expressed at the improvement in the Society's financial position as a result of the economies put in practice last year. Various matters of business were brought forward and discussed, and after the preparation of its annual report the Council adjourned.

In the afternoon the Society met at 2.30 o'clock. Prof. Lochhead, the President, on taking the chair, congratulated the Society on the large and comfortable room in the London Public Library building, in which they were assembled, and into which their library and collections had recently been removed. The improved quarters and greater accessibility would, he felt sure, increase very much the popularity of the Society and add to its usefulness. He then paid a tribute to the memory of the late Mr. John Alston Moffat, the curator and librarian for many years, who died at the end of February last. "We all," he said, "missed his kindly face and gentle courtesy. He did much good work for the Society and in entomology, but at the ripe age of nearly eighty years, we could not have expected a longer maintenance of the industry and activity that characterized his earlier days." The Society was fortunate in having Dr. Bethune to fill the vacant place. The reports of the Directors on the insects of the season in their respective Divisions were then called for by the Chairman.

REPORTS ON INSECTS OF THE YEAR.

DIVISION NO. 1—OTTAWA DISTRICT. BY C. H. YOUNG, HURDMAN'S BRIDGE.

I am glad to be able to report that there have been no serious outbreaks of any injurious insects during the season of 1904, in the Ottawa district. The whole season has been a remarkable one for the absence of insects of all kinds. In the eight years, during which I have resided near Ottawa and collected insects, I have never in any season seen so few. This no doubt was due in a large measure to the unfavorable weather which prevailed, the nights par-

ticularly being cold and disappointing. The only time during which any success at all was to be obtained from collecting was from about the middle of May till about the middle of June.

Of injurious insects, the most serious outbreak was that of two kinds of cutworms, viz., the Red-back Cut Worm (*Paragrotis ochrogaster*) and the Dark-sided Cutworm (*Paragrotis messoria*). The former of these was the most abundant, and did considerable damage. Those who tried the poison bran-mash had remarkable success. This is a splendid remedy, being made by simply moistening some bran with sweetened water and adding Paris green in the proportion of half a pound of Paris green to 50 lbs. of bran. The mixture may then be scattered among the plants to be protected, and strange to say the cutworms will feed upon it in preference to the growing plants.

The Colorado Potato Beetle was very plentiful, but was easily kept under control where the plants had been sprayed with Paris green and water. Root Maggots were destructive throughout the district. The Onion Maggot did the most harm and some of my neighbors lost all their plants before the pest was detected. It is to be regretted that there is no good practical remedy for these troublesome insects. For the Onion Maggot mixtures containing some form of carbolic acid have given good results in the hands of some. These have to be applied just as soon as the young plants appear above the ground, and further treatments made at intervals of a week or ten days. The Turnip Aphis was rather prevalent in some fields, but I do not think it did much damage, as it was accompanied by numerous parasites.

The Eye-spotted Bud-Moth was abundant in one orchard, being observed particularly on a crab apple tree.

The nests of the Fall Web-worm have been rather noticeable, particularly on shade trees. There is no reason why these unsightly nests should be allowed to remain on the trees. If the twigs bearing the nests are cut from the trees and burned, all the caterpillars which are inside these tents will be destroyed.

In my last report I omitted to mention a slight infestation of a small bristly caterpillar, which I found at Meeck's Lake, Que., attacking cabbages. Dr. Fletcher has just told me of a similar, but more important outbreak of the same species (*Evergestis straminealis*) in the Maritime Provinces. An account of this latter and notes on this new pest of cabbages and turnips will be found in the Report of the Entomologist and Botanist to the Dominion Experimental Farms for 1904. This insect, which has been given the name of the Purple-banded Cabbage Worm, did not do very serious damage to the cabbage plants at Meeck's Lake in 1903, only two or three specimens being noticed on each plant.

During the year I have continued to collect the lepidoptera of the Ottawa districts, but outside of a collection of over 700 specimens of microlepidoptera which I made, I did not take very many interesting butterflies or moths. Over fifty specimens of my collection of micros have been very kindly named for me by Mr. W. D. Kearfott, of Montclair, N.J., who I am pleased to state found some very interesting species, and one or two which may be undescribed.

DIVISION No. 2—MIDLAND DISTRICT. BY C. E. GRANT, ORILLIA.

Very few insect pests have come under my observation or have been reported to me this year—in fact like the previous two years most insects were very scarce. Whether the cold weather last winter or the cool summer are responsible for the scarcity I do not know, but when you have to hunt for a

specimen of *A. plexippus*, *C. philodice* or *P. rapæ* and other common butterflies there must be indeed some great drawback to their propagation. I made some very good catches, however, of insects not before taken here but unfortunately I have not had time to work out their identification. The following noxious insects were reported to me or observed.

Phorbia ceparum, the Onion Maggot—this insect was again reported as very destructive. I recommend carbolic acid to be applied according to Dr. Fletcher's formula.

Anthrenus scrophulariæ—the Buffalo beetle—I had numerous complaints from the ladies of Orillia of the havoc caused by these beetles. They seemed to be extremely common this year but I could not suggest a remedy.

Pulvinaria innumerabilis—the Cottony Maple Scale—this insect was very plentiful on the maple trees of Orillia and must have caused some damage to the trees but will likely not appear next year as it is about six years since I noticed it as plentiful before.

Doryphora decemlineata (Potato beetle) and *Carpocapsa pomonella*—the Codling moth—were about as plentiful as usual though the apples were not nearly as good a crop as last year.

Haltica chalybea (the Grape-vine Flea-beetle). This insect was very numerous and attracted the attention of most vine growers in the vicinity.

Cut Worms and the grubs of June beetles (*Lachnosterna fusca*) were very plentiful.

Malocosoma Americana and *disstria*—(Tent caterpillars)—were quite scarce and have been now for three years.

Nematus ribesii. It is a remarkable fact that this currant worm appears to have left us. During the last two years currant bushes left without protection from hellebore or Paris green have not had a leaf eaten, whereas in former years they would not have had a leaf remaining.

Crioceris asparagi and *12-punctata*. I have kept a sharp lookout for these beetles amongst the neighboring asparagus beds, but the destroyers have evidently not reached this northern country as yet.

DIVISION NO. 3—TORONTO DISTRICT. BY J. B. WILLIAMS.

As an inhabitant of a large city, I have not many opportunities of hearing about the pests that are troubling the farmers and fruit-growers; and cannot, therefore, say very much about them.

In Toronto itself the Tussock Moth (*Hemerocampa leucostigma*) has done a great deal of damage this year to the shade trees of the city. Mr. Chambers, the Park Commissioner, tells me that they were about fifty per cent. more numerous than last year, and they most affect parts of the city where chestnut trees are abundant. He has tried, this year, a plan of encircling the trees with a ring of sheet-brass, frayed out on the lower edge. This has been fairly successful in preventing caterpillars from ascending the trees. As soon as the leaves have fallen he intends to have the egg-masses collected from the trees in the streets and public parks and burned, as the City Council made a grant this year for that purpose; but in order that the pest may be got under control it is most necessary for private owners to co-operate in this work, and clear the egg-masses off their own trees; otherwise it is almost waste of time to clear adjoining shade trees, for they are soon occupied again by caterpillars from private grounds and gardens.

There has been a remarkable abundance of Walking-stick insects (*Diapheromera femorata*) Fig. 1, in Niagara Glen this year; they have also been more plentiful than usual around Toronto. Some of us were at the Glen on the 18th of August, and took a few specimens, nearly all of which were males, but did not notice, then, anything remarkable in their number. Dr. Brodie was over again on September 18, with some friends, and reported them as very numerous; many specimens having fallen on them from the trees, as they walked through the woods; so I went over on September 23 to get a few more specimens. I could have got hundreds, if I had wanted them. They are not generally very plentiful around Toronto; one may sometimes get about a dozen in an afternoon by specially looking for them; but often one may not see that number in a whole season.

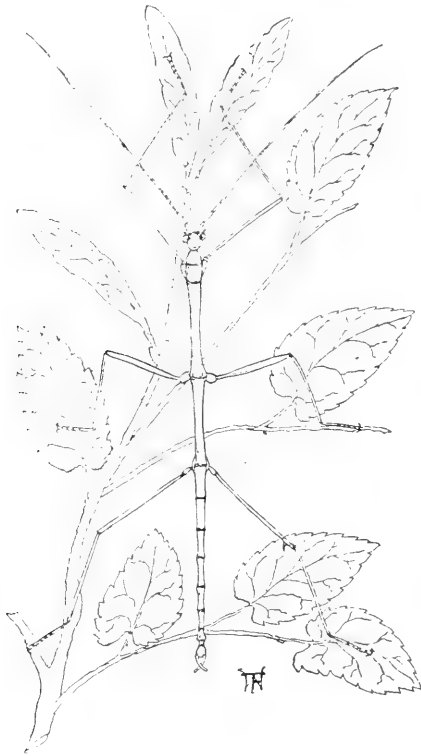


Fig. 1. Walking-stick insect.

I have read accounts of their being very numerous in parts of Pennsylvania; but I never expected to see such hosts of them in Canada as I did on the afternoon of September 23. In a part of the north end of the Glen, where they were most numerous, many of the bushes were quite stripped of their foliage, only the thick veins of the leaves being left, and some large trees also were quite bare.

On one tree, whose top still retained a little foliage, there was a line of them almost covering one side of the trunk and reaching from the ground as far as the eye could see. Some were constantly running across the paths so that it was difficult to avoid treading upon them; and a continual dropping could be heard as they fell from the trees and bushes. I took some large ones, that were at least half an inch longer than the average Toronto

specimens. These were on the outskirts of the crowded parts, as the supply of food was more plentiful than in the congested district, where it seemed to be almost exhausted, and the specimens were small. (Specimens from Niagara and Toronto were exhibited, showing the different sizes.)

I was near Jackson's Point on Lake Simcoe the beginning of September, and found the Potato-beetles rather numerous. They suddenly increased about the 5th of September, and were very plentiful along the roads for a day or two. I heard that some potato crops had suffered a good deal from them.

Butterflies have not been generally plentiful this year. The Monarch (*Anosia plexippus*) is the only one that I have seen a really good number of at one time. On August the 24th, they were very thick at the north end of High Park. You could hardly stand anywhere in an area of several acres without seeing seven or eight of them almost within striking distance. The first of this species seen during the present year was on May 10th, and the last on October 18th, both on Yonge street, in the centre of the city. Where had the first come from, and where was the last going to?

I heard from a friend, living just north of Toronto, that ants had been very troublesome in his garden this summer, and he thought they injured his potato plants; but I did not have an opportunity to secure any specimens, and so do not know what kind of ants these were.

In the discussion that followed the reading of this report, Dr. Fletcher, Mr. Balkwill, Dr. Bethune and Mr. Fisher, all stated that they had never seen any injury done to foliage by ants. The damage was probably done by some species of aphids, and the ants were attracted by them to the plants.

DIVISION No. 4—HAMILTON DISTRICT. BY GEORGE E. FISHER, BURLINGTON.

In submitting my report of insect conditions during the past year, permit me to explain that the business in which I am engaged is so exacting of my time there was little opportunity for investigation, which is to be regretted, as the advantage to growers of directing the attention of this important meeting to conditions that really exist cannot be overestimated.

The Entomological Society's year just closing was not in my district suitable for insect advancement. The sudden plunge from almost tropical to Arctic weather which occurred in October last, unexpected even by the insects, was a terrible shock and put most of them out of business. This followed by a winter of unprecedented fridity and a cold wet summer that came late, cut them off in large proportion and seriously hampered development. Unfortunately this abnormal weather which so seriously inconvenienced insects was equally trying to fruit crops, trees and plants. Apples and plums were not plentiful in some sections and where this occurred there seemed to be a curculio or codling worm for every specimen that formed. A great many plum trees had died. Peach trees have fared better. There will be a rattling among the dry plum trees when spring comes; and as the supply of plums has been greatly in excess of the demand of late many dead and dying orchards will not be replaced. The roots of fruit trees are more tender than the tops and I would emphasize the importance of a cover crop for root protection in winter. Orchards may be cultivated with much advantage down to July 15th, but after that date it is equally advantageous to give the weeds full possession or in the absence of weeds to sow something.

Some of the insects that have occasioned trouble from time to time in this section were hardly to be found, particularly Canker Worm, Pear Psylla, Cherry Maggot, Stink Bug and Pea Weevil, while others unusually bad were

the Potato Beetle, Asparagus Beetle, Plum Lecanium, Curculio, Codling Moth and San Jose Scale.

There are some fine examples of successfully combatting Plum Lecanium and Oyster Shell Bark-louse with lime and sulphur. In several instances no live insects have been observed since the treatment was given in the spring.

For some reason the Pea-Beetle did not appear and farmers count on growing peas more extensively next year. For a long time it has been my contention, that a severe winter will destroy the Pea-Beetle and our present experience seems to bear out this idea.

The San Jose Scale was on deck as usual when summer came; not however without suffering a heavier loss than from any previous winter in Canada. Owing to the cold spring the larvæ did not appear till July, about two weeks after the usual time, and the multiplication during the season was not nearly so great as in ordinary years, but was sufficient to greatly increase the degree of infestation beyond what it was a year ago. The area of infested sections is increasing, as the scale (besides increasing the density) reaches out continually and extends the limit. Several new infested points were discovered. One new outbreak not very far from home I have had under observation during the summer. Where the scale was plentiful and the vigour of the trees reduced, the effect of the winter was very marked. Many such orchards have already died and others cannot long survive. The peach orchards are so reduced by scale and frost that there will be no glutted markets until other orchards are produced.

Realizing this, the more intelligent growers treated their orchards last spring. A greatly increased quantity of spraying material was used which was again supplied by the Government at half cost as follows:—8,631 gallons of crude petroleum, 772 112 lb. sacks of sulphur and 40 bbls. of McBain's crude carbolic acid mixture which cost \$17.50 per barrel. This latter was used regardless of the price (which is prohibitive) with results somewhat better than last year, but not very satisfactory. The crude petroleum was used mostly in the township of Niagara and my information is that its use will not be continued as most of the growers now recognize the superiority of lime and sulphur which has come to the front very much during this season. In my judgment there is no spray remedy for scale equal to it and its effect as a fungicide is such that fungus did not appear in considerable quantity where it was used on trees, bushes or vines; and on orchards which had been treated regularly there was apparently no fungus at all. In the spring of 1902 an orchard comprising 160 apple, pear, plum, peach and cherry trees somewhat infested with scale was sprayed with 20 bbls. of a heavy mixture of lime and sulphur thoroughly cooked. The trees were whitened in every part and attracted much attention. Although there has been no subsequent treatment there is apparently no live scale remaining and this is not the only instance of perfect work in killing the scale with a single operation.

Letters from New Jersey complain of the inefficiency of lime and sulphur and speak of returning to crude petroleum. These letters also explain their methods of preparation and what better results need they expect? In many cases they depended upon the slaking lime to reduce the sulphur, using both in small proportion and making a weak mixture. When they cooked it, the boiling was continued only from thirty minutes to an hour which is insufficient. For best results (and these alone are satisfactory) the wash should contain $\frac{1}{2}$ lb. of sulphur to the gallon and enough of lime to thoroughly reduce it, say $\frac{1}{2}$ lb. to 1 lb. of lime to the gallon and the cooking be continued two full hours. At the end of the first hour it will be changing color. In a little longer time the color will be a good amber and tinged with

red. A little later this amber will have become much darker and have a green shade. When this condition is reached the pumps do not clog; the work of applying it is not so objectionable and if the trees be well covered a good result is guaranteed.

As far as we have gone I have discussed this question entirely from the standpoint of a fruit-grower which in your judgment may seem out of place at this meeting. This is the only means I now have of reaching the people and my desire to encourage and assist them must be my apology.

DIVISION No. 5—LONDON DISTRICT. BY R. W. RENNIE.

No case of serious injury by insects has been reported to me this season. Of course, we have had all our old enemies with us, but not in larger numbers than usual, excepting probably the Tent caterpillars (*Clisiocampa Americana*) which appeared in large numbers early in the season, but which seemed to confine themselves mostly to the wild cherry, orchards being comparatively free from them.

One pest, which is ordinarily called "Red Spider," and is quite common in gardens of sandy soil, which also is not very particular as to its food plants, has selected a new one this year, at least it is the first time I have observed them on this plant, namely, the tomato.

About the first of August I noticed one of my tomato plants looking unhealthy, and upon investigation found it had been attacked by these mites; some days afterwards, while walking in the country, I noticed some tomato plants which appeared to be suffering from the same cause, and upon examination such proved to be the case. Several other places were also noticed during the season.

In my own garden the plants attacked did not set any fruit above the second cluster of buds, the leaves curled in tightly, very much like the leaves of the shrub-snowball, when attacked by *Aphis*, making it almost impossible to apply any remedy.

If the pest should take generally to the tomato, it will mean serious loss to private and market gardeners, as it will be very difficult to apply any remedy in the fields owing to the leaves curling so tightly and the mites being on the inside.

DISCUSSION OF THE DIRECTORS' REPORTS.

In the discussion which followed upon the reading of the Directors' reports, the first subject taken up was that of the remedies employed for the San Jose Scale.

DR. FLETCHER stated that he had used the lime and sulphur wash after slaking only, without boiling, on Snowballs (*Viburnum*) for *Aphis* with good results, but had not tried it for the San Jose Scale.

MR. FISHER said that one great cause of failure with this wash was that the boiling was not continued long enough; the mixture was not fit to use till the green shade appeared. This he had learnt as the result of repeated experiments. In California the boiling process was continued for three hours, but he had obtained the same results in two hours. The most effective mixture was made with the proportions of half a pound of sulphur to one pound

of lime; he intended, however, to use a mixture of equal weights of each. He did not consider it necessary that the wash should remain for any length of time on the trees as he found that the insects were killed by immediately.

PROF. LOCHHEAD thought that the continuance of the wash on the trees was important as a protection against fungous diseases, even if not necessary for the destruction of the scale. He was of opinion that making the mixture by slaking instead of boiling might do for the Aphis, but was not effective for the scale.

DR. FLETCHER was anxious that the question should be thoroughly tested, as, if slaking will do, a hundred people will make the wash by this easier process to one who will take the trouble to boil it for two hours.

MR. FISHER then referred to the Pear-tree Psylla. In February his man used lime slaked and applied without any sulphur; he put it on thick, as much as he could get to stick. The result was that the trees were perfectly cleared of the insect and of fungus, though the orchard had been condemned.

MR. MACOUN and he had experimented on a small orchard near Niagara which they treated with plain white-wash. Some trees they covered once, some twice and some three times. In the spring more scale was found under the white-wash than on the untreated trees! It seemed that the insect was actually protected against the severity of the winter by the white-wash.

This year at Burlington the Psylla was absent, though they had always had it for many years previously. No less than 400 dwarf Duchess pear trees were killed by it only a few years ago. At that time, unfortunately, he did not know that it could be controlled by kerosene emulsion, for the lime and sulphur wash. The latter should be applied between the middle of March and the middle of April. If applied in December the lime and sulphur wash injures the tree because the wood is not sufficiently matured and late in the spring it injures the buds.

MR. BALKWILL stated, in reference to the Pea-weevil, that it was very bad this year in some places about London, while some farms were quite free from it.

MR. EVANS said that it had entirely disappeared about Trenton; he thought that the exceptionally cold winter had killed the beetle.

DR. FLETCHER urged that now is the time to fight this insect while its numbers were reduced and it was comparatively weak; everyone should fumigate his peas and make a complete destruction of the weevil.

MR. FISHER, in reply to an enquiry, said that the New York Plum Scale had increased from neglect in many places; the severe winter had not affected it. The Oyster-shell Bark-louse was entirely killed by the lime and sulphur wash. Lime used alone has only a mechanical effect by causing the insect to fall off with it, but does not itself kill the louse.

He wanted to know whether there was any practicable remedy for Wire-worms. Acres of melons had been destroyed by them in his district.

DR. FLETCHER advised double plowing—in early August and in September; Mr. Fisher replied that this would not be practicable in the case of tomatoes, but both Dr. Fletcher and Prof. Lochhead said that Wire-worms did not attack tomatoes, but were often very destructive in wheat fields and to other crops. In the case of melons Dr. Fletcher advised trapping the parent-beetles by means of poisoned potatoes; these should be raw, sliced, and dipped in Paris green and water, and then scattered about the infested places. This would be of use as a protection for the future, but there was no known remedy that was practicable for the Wire-worms themselves nor for white grubs, the larvæ of June beetles, which are also root-feeders.

MR. FISHER said that it had been recommended to plough rye under where melons were to be planted on the supposition that the Wire-worm would find enough food in the rye and would leave the roots of the melons alone.

DR. FLETCHER replied that the theory was incorrect, as rye was distasteful to these worms and kept them away. If wheat or oats were ploughed under instead they would be attracted. A cause of the trouble in the case of melons was that the large quantity of manure employed served as a great attraction to the Wire-worms. The reason for the ploughing that he recommended was that the insect became mature in the second autumn after the eggs were laid; ploughing in August destroys them in the pupa state, and the repetition in September disturbs the beetles in the ground and by bringing them to the surface ensures the death of a large proportion.

MR. EVANS said that he had known acres of tomatoes to be destroyed by Wire-worms.

MR. FISHER stated that he had observed the same thing. He had also found that if tomatoes were sown early and well-grown in hot-beds before planting out, they were then large, over-grown and tender; if the weather should be unfavorable, the lower leaves became blighted. Much the same thing happened with potatoes which had grown rapidly. This year in his neighborhood the Colorado beetle had in many cases left the potato plants and attacked the tomatoes, causing much destruction; it had also been very bad on egg-plant.

DR. FLETCHER said that the Colorado beetle was worst of all on egg-plant, very bad on potatoes and least injurious to tomatoes.



Fig. 2. Squash Bug.

MR. FISHER next referred to the Squash-bug (Fig. 2), commonly called the "Stink-bug" and sometimes "the Bishop-bug" (*Anasa tristis*). Though it had been abundant and very injurious for a long time, this year he had seen none. Last year it took three days to get 20 tons of pumpkins for his canning factory; this year 30 tons were procured in two hours—thanks largely to the absence of this bug. As a general rule it was difficult to grow pumpkins, owing to the destruction of the foliage by the Squash-bug. The striped Cucumber beetle was, however, as abundant and injurious as ever; he had been informed that it might be got rid of by watering with a solution of one pound of saltpetre in ten gallons of water.

DR. FLETCHER stated that in all his experience he had never known insects of all sorts so scarce as they were this year, and this was the case from the Atlantic to the Pacific. Other members from different parts of the country corroborated the statement.

REPORT OF THE COUNCIL.

The Council of the Entomological Society of Ontario begs to present its Annual Report for the year 1903-1904.

The fortieth Annual Meeting of the Entomological Society of Ontario was held in Ottawa, on the 3rd, 4th and 5th of September, 1903. The day meetings were held in the commodious and comfortable rooms of the Ottawa Board of Trade which were kindly put at the disposal of the Society and for the evening meetings the large Assembly Hall of the Normal School was secured.

The meetings throughout were fairly well attended both by members of the Society and by citizens of Ottawa. Several members of the Montreal and Toronto Branches were present and added greatly to the interest of the meetings.

The reports of the various Directors of Divisions showed that good work had been done in different parts of the Province in observing injurious insects and distributing information concerning remedial treatment. Most of these reports were illustrated by specimens. The full report of the proceedings and the discussions at the sessions has already been published and distributed to the members of the Society. This was the Thirty-fourth Annual Report on practical and general entomology and was presented to the Honorable the Minister of Agriculture for Ontario in December last and was printed and distributed in March.

It contains 116 pages and is illustrated with 59 wood cuts and 5 plates; one of the Rev. G. W. Taylor, an active member of the Society for many years who has done excellent work in fostering the study of practical and systematic entomology in British Columbia and was at one time the honorary Provincial Entomologist. Four plates show the results of remedial treatment for the San Jose Scale carried on under Prof. Lochhead, the President. Besides the account of the annual meeting, the reports of Divisions and Branches, the sections and officers at London, and the President's Annual Address on "The Progress of Economic Entomology in Ontario," the volume contains papers on the injurious insects of the year by Prof. Lochhead, Dr. Fletcher, Messrs. C. Stevenson, A. H. Kilman and T. D. Jarvis; "The present condition of the San Jose Scale in Ontario," and "A key to the insects affecting the small fruits," by Prof. Lochhead; "The Entomological Record for 1903," a most useful and important contribution by Dr. Fletcher; "A menace to the Shade-Trees of London," and "The Great Leopard Moth," by Dr. Bethune; "A card system for notes on Insects," by A. F. Winn; "The Syrphidae of the Province of Quebec," by G. Chagnon; "An interesting enemy of the Iris," and "Basswood, or Linden, Insects," by A. Gibson; "The food-habits of Hymenopterous Insects," by Dr. Fyles; "Collecting at Light in Manitoba," by A. J. Dennis; "Fly-tormentors in New Ontario," by T. D. Jarvis; "Hunting for Fossil Insects," by Dr. S. H. Scudder; "Recollections of the past," by the late J. A. Moffat. There were also full reports of Dr. L. O. Howard's addresses on "The Transmission of Yellow Fever by Mosquitoes," and the work being carried on by the Washington Division of Entomology against the Cotton Boll Weevil. The volume closes with a biographical sketch of the Rev. G. W. Taylor and an obituary notice of the late Prof. A. R. Grote, one of the honorary members of the Society.

The Society regrets very much that the distribution of this Annual Report was so greatly curtailed owing to the destruction in the great Toronto fire of April 19th, of no less than 5,000 copies, together with all the plates and engravings used in its illustration. These copies were to have been bound

up with the report of the Ontario Fruit-Growers' Association and given to its members and to those of the Provincial Horticultural Societies.

The Canadian Entomologist has been regularly issued at the beginning of each month. The 35th volume was completed last December, and contains 352 pages illustrated with six full-page plates and fifteen original figures in the text. The contributors number sixty-one, a larger number than usual, and represent Canada, the United States, Great Britain, Germany, Luxemburg and Cuba.

During the greater part of the year meetings for the study of Entomology have been held on Saturday evenings, alternately with those of the Botanical and Microscopical Sections. Several very interesting and enjoyable excursions were made to places in the neighborhood of London by the entomologists and botanists and their friends. The Council regrets very much that owing to the removal of several of its most active members the Ornithological Section has not held any meetings during the past year, and the Geological Section has not been revived, though Dr. Woolverton continues to give lectures on Geology to the students of the Western University.

It is a matter of much gratification that the Council have been able to lease the large and convenient room in the Public Library on Queen's Avenue, in which the annual meeting is now being held. The room in the Y. M. C. A. building occupied by the Society for the last eight years, was very inconveniently situated and had become too small for the steadily increasing library and collections. The removal was carefully and safely effected under the direction of Messrs. Bethune and Balkwill, and to them the thanks of the members are due for the labour they bestowed upon it and the excellent order in which the property of the Society is now to be found.

The Council desire to place on record their profound regret at the loss they have sustained through the death of Mr. John Alston Moffat, which took place on the 26th of February last after a prolonged illness. For fourteen years Mr. Moffat discharged the duties of Librarian and Curator of the Society with the greatest devotion and care. He was always ready to do everything in his power to further the objects of the society and to assist the members in their investigations and studies. His kindness and unfailing courtesy endeared him to all who had the pleasure of his acquaintance. He contributed many valuable papers to our magazine "*The Canadian Entomologist*," and to our annual reports to the Legislature of Ontario; his scientific attainments thus became widely known and his work in some sections of the Lepidoptera was much appreciated.

All which is respectfully submitted.

WM. LOCHHEAD,
President.

REPORT OF THE MONTREAL BRANCH.

Minutes of the 258th regular and 31st Annual Meeting held on the 9th of May, 1904, at the Natural History Rooms, University Street, Montreal.

Minutes of the last regular meeting were read and confirmed, and the minutes of the previous annual meeting taken as read, and confirmed.

The following members were present:—

Messrs. Charles Stevenson, A. F. Winn, A. E. Norris, L. Gibb, A. Griffin, G. R. Southee, Geo. A. Moore, and Master K. R. Stevenson and Alfred Holden, visitors.

The President reported that Mr. Gibb's case had been filled and sent to St. John's School.

The Librarian reported that the new unit to bookcase had been ordered but had not yet been received.

The President, Mr. Charles Stevenson, read the following report on behalf of the Council:—

The Thirty-first Annual Report of the Council of the Montreal Branch of the Entomological Society of Ontario.

Your Council have pleasure in presenting the following report for the Session 1903-1904.

Nine regular meetings were held with an average attendance of eight, at one of which we had the pleasure of the attendance of Dr. James Fletcher.

The following papers were read, the greatest number since the foundation of the Branch.

1. Annual Address of the President..... Charles Stevenson.
2. Method of coloring photographic lantern slides of Butterflies. (Illustrated)..... A. E. Norris.
3. The Lepidoptera of Kirby's insects of the Fauna Boreali-Americana..... H. H. Lyman.
4. Report on the Annual Meeting of the Entomological Society of Ontario, 1903 Charles Stevenson.
5. Notes on the Season, 1903. Western Quebec Charles Stevenson.
6. Notes on the Season, 1903 Geo. A. Moore.
7. Ten minutes collecting late in October..... Charles Stevenson.
8. A late capture of a Cerambycid Charles Stevenson.
9. To preserve the natural colors of Dragonflies Charles Stevenson.
10. My first attempt to rear Caterpillars Edward Denny.
11. Notes on Cerambycidae with special reference to the Prionidae..... G. Chagnon.
12. Notes on Ennomos magnarius, Guenee A. F. Winn.
13. On occurrence of larvæ of Fenisea Tarquinius in November A. F. Winn.
14. Miscellaneous Entomological Notes H. H. Lyman.
15. Collecting Notes for 1903 H. H. Lyman.
16. Notes on Hepialus mustelinus, Pack A. F. Winn.
17. Collecting at light during the Season of 1903 A. E. Norris.
18. Phymatidae Geo. A. Moore.
19. Montreal Gortynas H. H. Lyman.
20. An Address on various insects Dr. Jas. Fletcher.
21. Membracidae Geo. A. Moore.
22. Notonectidae Geo. A. Moore.
23. Remarks on Dr. Fletcher's New Species and Varieties of Canadian Butterflies A. F. Winn.
24. Attempts to rear Cerambycidae G. Chagnon.
25. Capsidae or Leaf Bugs Geo. A. Moore.
26. Thecla Laeta Edw. A. F. Winn.
27. Cyanide Bottle for Micro-Lepidoptera Charles Stevenson.

Two field days were held, one at St. Hilaire, 24th May, and the other at Rigaud, July 1st.

Two cases of insects have been presented to schools with the hope of arousing an interest in insect study among the pupils, one to the McGill Normal School, and the other to the St. John the Evangelist School.

Five of the members attended the annual meeting of the Entomological Society of Ontario which was held in Ottawa and four papers from our Branch were read.

Our membership remains the same numerically.

Respectfully submitted on behalf of the Council,

(Signed.) CHARLES STEVENSON,
President.

9th May, 1904.

The Treasurer's account showed a balance on hand of \$58.10.

The Librarian submitted the following report:—

Our bookcase is full. One unit as authorized by the Society has been ordered, but has not yet arrived. The library contains many useful books, including "*The Canadian Entomologist*," Vol. I to X, bound and unbound.

The following were added this year:—

1 Bulletin No. 59, 1902, H. H. Lyman.

1 Bulletin No. 64, 1902, H. H. Lyman.

Paper on Plusidæ, Dr. Ottolengui.

7 Annual Reports of the Entomological Society of Ontario, 1895-1904.

1 Paper Book "Insects affecting forest trees, 1903."

A quantity of paper for copies of members' papers from A. F. Winn.

1 Bulletin No. 68, N. Y. State Museum by purchase.

Proceedings of the South London Ent. & Nat. His. Soc., 1902, L. Gibb.

Check list of Coleoptera, G. R. Crotch, M.A., 1874.

Label list of insects, Dom. of Can., 1883, A. F. Winn.

Bibliography of Canadian Entomology, 1902, Dr. Bethune.

The following were donated by Charles Stevenson:—

Monthly Bulletins, Pennsylvania, No. 4-9-10-11-12, Vol. 1, 1904.

6 copies of papers read during 1903.

The President's (Charles Stevenson) Annual Address.

Report of Annual Meeting at Ottawa, 1903.

Report of case of insects donated by our Society and arranged by Charles Stevenson.

29 parts of "*Canadian Entomologist*," containing incomplete volumes 17-18-19-22, by A. F. Winn.

45 Pamphlets and "Psyche" (11 vols.) from J. G. Jack.

(Signed.) A. E. NORRIS, Librarian.

The Curator read the following report:—

The cabinet is complete as far as the drawers are concerned and I am now ready for generous donations from the members. It should be our pride to have a good local collection of all orders if possible. The following members have contributed since the last Annual Meeting:—

Mr. Lachlan Gibb, 10 Butterflies and 34 Moths.

H. H. Lyman, 5 *Melitæa* and 3 *Phyciodes* Butterflies. "These 8 butterflies are not likely to be taken here."

A. F. Winn, 3 *Ichneumons*.

G. Chagnon, 80 *Diptera*.

D. Brainerd, 44 Moths.

Respectfully submitted,

(Signed) A. E. NORRIS, Curator.

The President, Mr. Charles Stevenson, read his Annual Address.

Mr. Gibb moved and Mr. Griffin seconded that these reports be accepted.
Carried.

The following officers were elected for 1904-1905 :

President A. E. Norris.

Vice-President ... A. F. Winn.

Librarian and Curator D. Brainerd.

Secretary-Treasurer ... Geo. A. Moore.

H. H. Lyman.

Council ... Charles Stevenson.

L. Gibb.

Mr. A. F. Winn gave a talk on the Lycænidae.

A. E. Norris "Hydræcia" illustrated by lantern views and other slides of butterflies and moths.

Geo. A. Moore on the Leaf-Hoppers, Family Jassidæ.

Mr. Stevenson exhibited a specimen of *Aphodius erraticus* caught, June 1st, 1904, by K. R. Stevenson under stones at Maplewood, near Outremont. This is the first record of its capture in Canada. It was reported by Horn in the United States, and is an introduced species from Europe.

After the examination of specimens the meeting adjourned.

GEO. A. MOORE,

Sec.-Treas.

REPORT OF THE QUEBEC BRANCH.

The annual meeting of the Quebec Branch was held on the 19th November, 1904, at the house of the President, extensive repairs being carried on in Morrin College.

There were present: Rev. Dr. Fyles in the chair, Lt.-Col. Crawford Lindsay, secretary-treasurer, Rev. W. W. McQuaig, J. H. Simmons, Esq., Mr. Halton Fyles, Mrs. R. Turner, Mrs. Fyles, Mrs. McQuaig, Mrs. Simmons, Mrs. Seton, Mrs. Boulton, Miss Hamel, Miss Freeman, Miss MacLeod, Miss Hedge, Miss Bickell, Miss Johnson and Miss Winifred Fyles.

The minutes of the last meeting were read and approved.

The secretary stated that eight meetings had been held during the year, besides two field-days. Lectures had been delivered on the following subjects:—By the President: Pitcher Plant Insects—Insect Pests of the Oak—The Willows of Canada and the Insects that feed on them—Garden Pests and how to deal with them; by the Rev. W. W. McQuaig: Edible and Poisonous Fungi (two lectures); by Miss MacLeod: On Light and Colour.

The President then gave his annual address as follows:

I am glad to welcome so many of our members and friends to my house. Morrin College is undergoing extensive repairs, and will be in the hands of the workmen for some time to come. A few days ago I had our cabinet removed to a safe place in the laboratory of the college. I hope, when the repairs are completed, the college authorities will allow us, as in the past, to hold our meetings in that institution.

A few interesting things—entomologically speaking—have come under my notice in the past season:—

VESPA DIABOLICA.

In the 34th report of the parent Society, page 11, will be found a notice of a colony of this species which had their nest under the cap of a newel-post of a flight of steps to the verandah of the residence of J. H. Simmons, Esq. Attention was first drawn to this colony by a servant maid, who, while sweeping the steps, knocked her broom upon the post and brought upon herself an attack from the wasps. With a swollen and inflamed face, she rushed to her mistress, exclaiming: "Ah, Madame, les petites bêtes jaunes sont venues me piquiez;" (Ah, Ma'am, the little yellow flies have stung me).

Through the kindness of Mr. Simmons, I am now able to lay the nest of the wasps before you. It contains, you perceive, one tier of cells only, and this was closely attached to the under side of the cap. The number of cells is seven hundred. Between the cap and the top of the post itself was a small space as there was between the side casing and the post. The insects worked in the confined space under the cap and carried on their operations in darkness. They found entrance and exit through a small hole in a joint of the casing. The means taken by the wasps to prevent intrusion by predacious insects is remarkable. They suspended a series of paper curtains, some fifteen in number, which closed up the space between the post and the inner sides of the casing, so that an intruding insect, groping in the dark, would find itself entangled in a veritable labyrinth. If it happened to strike the well guarded way of the wasps, it would doubtless meet with a warm reception.



Fig. 3. Larva of Wasp: dorsal view, greatly enlarged.



Fig. 4. Parasite of *Cimex Americana*, showing under side, much enlarged.

It may be wondered how the larva of a wasp (Fig. 3), hanging in an open-mouthed cell, with its head downward, can retain its position. Last summer I had the opportunity of studying the live larva. I found a nest in which the first of the larvæ had attained their full growth. I found the creatures somewhat top-shaped, very broad at the shoulders so as to fill the opening of the cell and press upon the sides, and then gradually tapering to the extremity. The body ended in a pair of claspers which reached into the narrowed end of the cell. When a larva was turned out of its dwelling, I noticed that it extruded from its under side a series of excrescences as if to find a hold by means of these. I think we may say that the larva is held in place by its claspers, its pseudopodia, and by the pressure of its thoracic segments upon the sides of the cell.

A BATTLE ROYAL.

On May 29th, I witnessed, in the hangard at my place, a fierce contest between a female of *Vespa arenaria* and a spider. I separated the combatants, for I wanted the wasp for my collection. A few hours afterwards I noticed that the spider was dead.

A PARASITE OF *Cimbex Americana*.

Last fall, Miss Hamel brought me from Kamouraska, some larvæ of *Cimbex Americana*. On the 7th September, there broke from the under side of one of these, near the hinder parts of it, a remarkable parasitic larva (Fig. 4). It was an inch long and was dirty white in colour with a row of continuous yellow folds, extending the length of the body on either side. It had an irregular dorsal line of brown and an irregular side line just above the yellow folds. On the under side there was an undulated line on either side. The after part of the body was darker than the rest. The head was small and the four or five segments following tapered towards the head. The anal segment was truncated and yellow. I have no doubt that this was a larva of *Ophelctes glaucopterus*. A few days after this appeared I found a dead *Cimbex* larva some inches deep in the soil at the roots of a plant of *Aquilegia* that I was digging up. I inferred from this that parasitized *Cimbex* larvæ buried themselves; and I placed the parasite I had on some earth in a flowerpot and covered it with damp moss. I am sorry to say that this treatment was unsuitable—the larva died.

STRANGE FOOD FOR WIRE-WORMS.

On the occasion of our field-day at Montmorency, the Rev. Mr. McQuaig and myself wandered off in search of fungi. On examining a specimen of the Fly Agaric *Amanita muscaria*, we found a wire-worm eating into the stipe of the fungus. The Czar Alexis of Russia died from eating this species of fungus; the wire-worm seemed to be eating it with impunity. The poison of the Fly Agaric taken into the system paralyzes the nerves that control the action of the heart.

A little further on we found a specimen of the most deadly of all the fungi, *Amanita phalloides*, known as the "Death-Cup" and the "Destroying Angel", for the poison of which there is no known antidote. It acts upon the blood, dissolving the corpuscles. Strange to say, we found a wire-worm apparently of the same species as the other, biting a way into this.

FUNGOID GROWTH ON A WASP.

It is well known that insects are liable to destroying fungoid growths. Among some of the specimens captured by Miss Freeman, was one of *Crabro singularis*. Over the thorax and parts of the abdomen of this was such a growth as we are speaking of.

CAPTURES.

On June 17th, a fine specimen of *Macromia Illinoensis*, Walsh, was taken on the Louise Embankment. On June 27th, I found *Hylotoma dulciaria* at the Natural Steps, Montmorency. So late as September 12th I took a fine specimen of *Aeschna constricta* at a pond on Spruce Cliff. The species seemed to be plentiful. On September 27th, Mr. McQuaig found a female *Meloë angusticollis* in the same locality.

A very interesting paper by Mr. Albert F. Winn of the Montreal Branch was then read. It described in a charming way the haunts and habits of the water-lily moth, *Nymphula maculalis*, Clemens, found at Lake Charlebois, and the methods adopted for the capture of the insect. Some beautiful specimens of the moth, sent by Mr. Winn, were exhibited.

The Rev. Mr. McQuaig gave a graphic description of two fungi giving out very different odours. To the first, on the occasion of the field-day at Montmorency, he was drawn by the delightful perfume it emitted, which resembled that of Sweet Grass, but stronger. Let by the scent, he found the fungus in the recesses of a growth of young spruce and near the bolls of the trees. It was a species of *Hydnum*. It was remarked that perfumers might turn a knowledge of this to practical account, judging by the powerful scent retained by the dried specimens of the fungus exhibited.

Mr. McQuaig, continuing, stated that while taking a walk with the President in the woods near the Levis cemetery, they encountered the same fine perfume and, after a little search, found large patches of the fungus in the shade of the most entangled growths of spruce.

The other fungus he wished to refer to was a mal-odourous one, *Phallus impudicus*, known as the Stinkhorn. He gave a minute description of this, both in its egg-like stage and after its full development, when it emitted its overpoweringly offensive odour.

Mrs. Turner said that she had found several specimens of this fungus in her garden at "The Cedars", Island of Orleans. Numbers of Blue-bottle flies were buzzing about them and settling upon them.

Mr. McQuaig explained that doubtless the offensive odour was intended to aid in the dissemination of the species. It attracted carrion insects and these carried away the spores which adhered to their feet.

The officers chosen for the year were:

President, Rev. Dr. Fyles; Vice-President, Miss E. Macdonald; Secretary-Treasurer, Lt.-Col. Crawford Lindsay; Council, Rev. W. W. McQuaig, Hon. R. Turner, Mrs. Turner, Miss Bickell, Miss Freeman.

Hearty votes of thanks were passed to the authorities of Morrin College for the countenance they have given the Association, to the President and the Secretary-Treasurer for their services, and to Mr. A. F. Winn for his valuable paper.

REPORT OF COUNCIL.

The Branch now includes twenty-six members (twenty-three adults and three juniors).

The Treasurer's report is submitted and will no doubt be found satisfactory.

During the past year eight meetings were held at which interesting lectures were delivered and two enjoyable field-days were held.

Our thanks are due to the authorities of Morrin College for having continued to allow us the use of their rooms for our meetings, and also to the President, Rev. Mr. McQuaig and Miss MacLeod, for their interesting lectures.

CRAWFORD LINDSAY,
Secretary-Treasurer.

REPORT OF THE TORONTO BRANCH.

The eighth annual meeting and ninety-fifth regular meeting of the Toronto Branch, Entomological Society of Ontario, was held in the Provincial Museum, Toronto, on the 19th of May, 1904.

SECRETARY'S REPORT.

I beg to herewith submit the annual report for the season of 1904:—

Our membership this year has been most gratifying in point of numbers, an increase of eight members over last year, and all in good standing, the total number now being fifteen.

During the last year we have kept up our subscriptions to publications as heretofore, and have been enabled to add doors to the fine large cabinet presented to the Society by Mr. McDonough, which now stands in the Ornithological room of the museum.

The permanent collection has been added to considerably, and through the efforts of our Curator a case of representative Butterflies found near Toronto, has been beautifully mounted and labelled and hung for public inspection.

Our specimens of Hymenoptera, Diptera and Hemiptera have also been sorted out, and each placed in their respective drawers.

The papers read and lectures delivered have been of a high educational order, shedding new light and knowledge, added to by the exhibition of specimens to illustrate the same.

Dr. Fletcher, of Ottawa, and Mr. Lyman, of Montreal, we are very greatly indebted to, for two of the most interesting and instructive lectures of the season.

Dr. Fletcher's lectures on "The Opening of Spring, and Spring Work" will not soon be forgotten by those fortunate enough to hear it. This meeting was splendidly attended, about fifty being present; the Canadian Institute and public schools being well represented.

Our financial statement this year has not been surpassed, no doubt owing to the increase in membership.

Your Secretary-Treasurer in closing, wishes to thank the members of the Toronto Branch for the help and courtesy extended to him, making his duties a pleasure to perform for the Society.

All of which is respectfully submitted.

J. MAUGHAN, JR.,

Secretary-Treasurer.

The following officers were elected for the ensuing year: President, Jr. Wm. Brodie; Vice-President, Paul Hahn; Secretary-Treasurer, John Maughan, Jr.; Librarian and Curator, J. B. Williams; Council, W. J. Fraser, Henry S. Saunders, J. H. Webb.

LECTURES AND PAPERS—SEASON 1903-4.

- 1st. J. B. Williams: "Butterflies in 1903 and Classification of same."
- 2nd. Exhibition of Specimens.
- 3rd. Arthur Gibson, Ottawa: "Some Work done in the Division of Entomology at Ottawa during 1903" (Published in Toronto World).
- 4th. Mr. Lyman, Montreal: "Moths of the Genus *Gortyna* and *Hydroecia*."
- 5th. E. M. Walker, M.B.: "Two collecting trips in Algonquin Park."
- 6th. Dr. Fletcher, Ottawa: "Opening of Spring and Spring Work."
- 7th. Annual Meeting; Dr. E. M. Walker and Mr. Paul Hahn: "Collecting in Algonquin Park". Illustrated by electric lantern.

REPORT OF THE BOTANICAL SECTION FOR 1904.

The Botanical Section of the Entomological Society of Ontario met for organization on the 7th of May, 1904, when the following officers were elected for the coming year: Mr. S. B. McCready, Chairman; Prof. Bowman, Vice-Chairman; Master H. C. Rennie, Secretary.

Nine fortnightly meetings were held during the season, at nearly all of which there was a satisfactory attendance, the average number present being about seven. Two very successful field-days were held, the first at Dorchester and the second at Komoka.

An interesting paper was read by Mr. Dearness on June 18th, on "Plant Societies", and many interesting talks on Botanical subjects were given during the year. A great variety of plants were brought to the meetings for examination and identification. The last evening of the season was devoted to fungi, of which an account was given by Profs. Bowman and Dearness.

S. B. MCCREADY,
Chairman.

REPORT OF THE MICROSCOPICAL SECTION.

The Microscopical Section of the Entomological Society of Ontario has much pleasure in presenting its fourteenth annual report. The meeting for reorganization after the summer recess was held on the 3rd of October, 1903, and the following officers were elected: Prof. J. H. Bowman, Chairman; Mr. R. W. Rennie, Vice-Chairman; Mr. C. E. Parsons, Secretary.

Prof. J. Dearness and the officers were appointed the Executive Committee for the year.

Thirteen meetings were held during the winter season, with an average attendance of nine members, besides a number of visitors. Papers were read or addresses given on the following subjects:

Aphids, Ants and Honey-dew: Rev. Dr. Bethune; Ferns, their Spores and Modes of Growth: Mr. S. B. McCready; The Inhabitants of an old Basswood Limb: Prof. Dearness; Barnacles Found on some Pine Logs: Prof. Bowman; Platino-Cyanide Crystals of Barium: Prof. Bowman; Collembola: Mr. F. A. Stuart; Sea-weeds from Santa Monica Bay, California: Mr. M. Westland; Algæ: Prof. Dearness.

These papers were illustrated by specimens and slides for the microscope. At nearly all the meetings a number of objects of interest and beauty were also exhibited and discussed.

J. H. BOWMAN,
Chairman.

REPORT OF THE LIBRARIAN AND CURATOR.

The following is the report for the year ending August 31st, 1904:

The number of bound volumes added to the library during the year was twenty-eight, making the number on the register 1,832. Among the new acquisitions there have been received volumes VIII and IX of the Harriman Alaska Expedition, being the two parts devoted to insects; Dr. Holland's *Moth-Book*, presented by the late librarian, Mr. J. Alston Mof-fat, to the Society as "an acknowledgment of its generosity in his declining years"; Sir George Hampson's *Catalogue of the Noctuidæ in the British Museum*, being volume IV of his "*Catalogue of Lepidoptera Phalænæ*"; and Rothschild and Jordan's "*Revision of the Sphingidæ*".

A large number of scientific magazines, bulletins of experimental stations, and other publications, have also been received. Many of these will be bound into volumes and the rest catalogued and arranged in such a way as to be readily accessible.

The number of volumes issued to members during the year was thirty-three.

The collections of Canadian insects have been increased during the year by the generous gift of 103 specimens (52 species) of Coleoptera and two specimens each of six species of Lepidoptera taken by Mr. Norman Criddle at Aweme, Manitoba. The local members have contributed specimens in various orders taken in the immediate neighborhood of London.

The Curator would very much like to receive specimens of almost all our Canadian insects to fill blanks in the cabinets and to replace old and imperfect examples. Any member who has specimens to spare would confer a favour by sending first a list of those which he is willing to present to the Society in order to avoid duplication. In many of the orders our collections are very meagre.

The removal of the Society's library and cabinets to the room in the Public Library building was satisfactorily accomplished last month, and no damage was done to either books or specimens. The increased space now available will enable the Society to find room for large additions to both the collections and the library.

Respectfully submitted.

CHARLES J. S. BETHUNE,
Librarian and Curator.

REPORT OF THE TREASURER.

Receipts and expenditures of the Entomological Society of Ontario for the year ending August 31st, 1904:

RECEIPTS.	EXPENDITURE.
Balance on Sept. 1st, 1903 \$293 34 Members' fees 362 68 Sales of pins, cork, etc. 90 59 Advertisements 35 50 Sales of Entomologist ... 119 50 Government grant..... 1,000 00 Interest 4 1½	Rent \$165 00 Pins, cork, etc. ... 57 38 Printing 701 23 Expense account ... 76 10 Annual meeting and report 176 05 Library 22 06 Salaries 262 50 Balance on hand 445 74
\$1,906 9½	\$1,906 06

We, the auditors of the Entomological Society of Ontario, hereby certify that we have audited the books and vouchers of the Treasurer and find them all well kept and correct, the above being a true statement of accounts up to August 31st, 1904.

S. B. MCCREADY,
W. H. HAMILTON,
Auditors.
J. A. BALKWILL,
Treasurer.

London, Ont., Oct. 25, 1904.

REPORT TO THE ROYAL SOCIETY OF CANADA.

The following is the report to the Royal Society of Canada from the Entomological Society of Ontario, through the Rev. C. J. S. Bethune, D.C.L., Delegate.

The Entomological Society of Ontario has now continued in active operation for two score years, and held its fortieth annual meeting in Ottawa on the 3rd and 4th of September last. Of the little band of enthusiasts who met in Toronto in April, 1863, for the purpose of organizing the Society, but three now survive, Dr. Wm. Saunders Rev. Dr. Bethune and Mr. E. Baynes Reed. It is gratifying to note that they have continued to take an active interest in the welfare of the Society from that time to the present.

"The Canadian Entomologist," the monthly magazine of the Society, is now in its thirty-sixth year of publication. The volume for 1903 contains 352 pages and is illustrated with six full-page plates and fifteen figures in the text, all from original drawings. The contributors number sixty-one and represent Canada, the United States, Great Britain, Germany, Luxemburg and Cuba. The principal articles may be grouped as follows: Descriptions of new genera, species and varieties in Lepidoptera by Prof. J. B. Smith, Dr. H. G. Dyar and Mr. G. M. Dodge; in Hymenoptera by Dr. W. H. Ashmead, Profs. T. D. A. Cockerell and H. T. Fernald, Messrs. J. C. Bradley, A. W. Morrill, J. C. Crawford, R. A. Cooley, C. Robertson, Rev. T. W. Fyles and Dr. S. Graenicher; in Diptera by Messrs. D. W. Coquillett, F. V. Theobald, and J. S. Hine; in Coleoptera by Prof. H. F. Wickham and Mr. C. Schaeffer; in Hemiptera-Homoptera by Prof. Cockerell, Messrs. A. W. Morrill, R. A. Cooley, A. L. Quaintance, G. B. King, E. B. Ball and W. T. Clarke; in Hemiptera-Heteroptera by Mr. C. Stevenson; and in Orthoptera by Messrs. E. M. Walker and E. S. G. Titus. Thirty-nine new genera are described, 106 new species and eight new varieties and sub-species.

Life-histories more or less complete, are given of the following insects: *Crocigrapha Normani* and several Canadian species of Apanteles by Mr. Arthur Gibson; the strawberry Aleurodes (*A. Packardi*) by Mr. A. W. Morrill; *Hydræcia appassionata* found boring in Sarracenia by Mr. H. Bird; the Apple Bud-borer (*Steganoptycha pyricolana*) by Prof. E. D. Sanderson; *Mamestra laudabilis* by Dr. H. G. Dyar; and several species of Mosquitoes by Mr. F. V. Theobald.

Papers on Classification. Nomenclature and systematic Entomology; the Wasps of the super-family Vespoidea by Dr. Ashmead; Arctic Hymenoptera by Mr. W. H. Harington; Nomadinae and Epeolinae by Mr. C. Robertson; Prof. Aldrich and Mr. Coquillett on Culex; Mr. J. C. Bradley on the genus Platylabus; Mr. E. M. Walker on the genus Podisma in Eastern North America; Dr. Dyar and Mr. A. Bacot on *Aglia tau*; Mrs. Fernald on Coccidæ; Dr. Fletcher and Prof. Grote on Lepidoptera; Prof. Cockerell and Mr. Titus on Hymenoptera.

Collecting notes, and papers on the geographical distribution of species, are given by Prof. A. D. Hopkins on Forest Insect Explorations; Mr. Coquillett on the Phorid genus *Ænigmatias* in Denmark and Arizona; Mr. G. B. King on Records of Coccidæ; Dr. Fyles on Quebec Diptera; Mr. J. D. Evans on the Coleoptera of North-Western Canada; Mr. W. T. Clarke on Californian Aphididæ; Butterfly notes from Toronto by Mr. J. B. Wil-

liams; Collecting in February by Mr. J. R. de la Torre Bueno; the capture of *Ægialites debilis* in British Columbia by the Rev. J. H. Keen.

Among the miscellaneous papers may be mentioned a House-boat collecting trip in China by Mr. C. L. Marlatt; a Coleopterous Conundrum by Mrs. A. T. Slosson; a Migration of Butterflies in Venezeula by Mr. A. H. Clark; the habits of *Ranatra fusca* by Mr. Bueno; the Spinning methods of *Polyphemus* by Mr. J. W. Cockle; papers on Coleoptera by Prof. Wickham, on Bees by Prof. Cockerell and Entomological notes by Mr. H. H. Lyman. There are also several reviews of new books by the editor and others.

The thirty-fourth annual report of the Society was published by the Ontario Department of Agriculture in March last. Its distribution has unfortunately been very much limited owing to the destruction of 5,000 copies by the disastrous fire in Toronto on the 19th of April. The volume consists of 116 pages illustrated with a portrait of the Rev. G. W. Taylor, four half tone plates of orchards affected by the San José Scale and sixty figures in the text; all of the blocks of these illustrations have also been lost in the fire.

The volume contains satisfactory reports from the Officers of the Society, the Sections in Botany, Microscopy and Ornithology, the Branches at Montreal, Quebec and Toronto, and from the Directors, Messrs. Young, Grant and Balkwill, on Insects of the year. Further notes on the season of 1903 are given by Messrs. Stevenson and Kilman, and extended reports by Dr. Fletcher and Prof. Lochhead. The latter, in his annual address as President, gave an interesting account of the "Progress of Economic Entomology in Ontario", and furnished further papers on "The Present Condition of the San José Scale in Ontario", and "A Key to the Insects Affecting Small Fruits". Dr. Fletcher contributed his very valuable "Entomological Record for 1903"; Mr. Arthur Gibson, papers on "The Insects Affecting Basswood", and "An Interesting Enemy of the Iris"; Dr. Bethune on "A Menace to the Shade-trees of London, Ontario", the Great Leopard Moth, and a memoir of the late Professor Grote; Dr. Fyles on "The Food-habits of Hymenopterous Larvæ"; Mr. Jarvis on "Fly-tormentors of New Ontario", and a list of injurious insects taken in the Abitibi Region; Mr. A. J. Dennis on a remarkable experience in collecting moths at light in Manitoba. Dr. S. H. Scudder gives an interesting account of his "Hunting for Fossil Insects" in Wyoming and Colorado; and the late Mr. Moffat furnished a paper on his "Recollections of the past". Dr. L. O. Howard, United States Entomologist, was a welcome visitor at the annual meeting and gave two most interesting addresses, of which abstracts are given in the report, on "The Transmission of Yellow Fever by Mosquitoes", and the warfare that is being waged against the Cotton Boll Weevil in Texas.

It is with profound regret that we place on record the death of Mr. John Alston Moffat, which took place in London on the 26th of February. For fourteen years he had been the efficient Librarian and Curator of the Society and had endeared himself to all who frequented the rooms by his uniform kindness and courtesy.

INSECTS AND WEEDS IN THE NORTH-WEST TERRITORIES.

By T. N. WILLING, REGINA, ASSINIBOIA.

It gives me a great deal of pleasure to be able to meet the members of the Ontario Entomological Society as a representative from the North-West Territories, a portion of Canada in which there is so much work yet to be done in the study of its insect life. Many of you have already ably assisted in this work and I hope to be able to call on you for yet more help in the identification of material collected. Moving about the country a great deal as I do in the capacity of chief Inspector of Weeds for the Department of Agriculture at Regina, my opportunities for collecting are much greater than for classification and study. As our Department has no official whose time is specially devoted to entomology, it falls to my lot to investigate insect depredations, and in this connection I may mention that preparations are being made for a reference collection of the insects injurious to crops. Fortunately the losses from insects in the Territories have not been heavy, but it would be too much to expect a continued immunity and there is no doubt a close watch must be kept to check promptly, if possible, any threatened danger from such a source. The annual visits of our popular and valued advisor, Dr. Fletcher of the Experimental Farm, have aided greatly in the dissemination of information relative to insects and weeds affecting crops, and I think no one has done more for the advancement of the study of natural history in the West than he.

Another help in this line is the work being done by our Territorial Natural History Society, which developed from the North-West Entomological Society, started by Mr. Percy B. Gregson, an untiring worker, who continues to be president. The Society is recognized by the Government and its annual report is printed as an appendix to that of the Department of Agriculture. The aim of the Society is to encourage the study of natural history in its various branches, giving prominence to the economic side, and also to gather material for collections which will be available for reference. Local branches are encouraged and records of the migration of birds are being made at points where observers can be found. Several of the members are keenly interested in the study of entomology and are doing good work, notably Messrs. F. H. Wolley Dod and Arthur Hudson, near Calgary, who make a specialty of the Noctuidæ and have added many new species.

It has been found that specialists have been exceedingly kind in identifying material sent them and my thanks are due to Dr. Fletcher and Messrs. Taylor, Kearfott and Dod for their services in this respect. Recently Rev. G. W. Taylor named some forty odd species of geometer moths which I had collected, and Mr. Kearfott has now in hand a lot of our western micros for study. Of Coleoptera I have a large number not yet classified.

During the season few insects attracted attention by their numbers. In May a multitude of hairy caterpillars were reported on the prairie north of Medicine Hat and proved to be those of a species of *Apantesis*. The appearance of such as were found on 30th May indicated that they were affected by parasites. Small pupa cases were soon found amongst the caterpillars, which were collected and from these ichneumon flies emerged about 25th June. No moths were obtained from the larvæ, but a small specimen of *Apantesis Williamsii* was taken with the net on 28th June where the larvæ had been so abundant.

In the same locality, but on the river flat, a grove of the box-elder, *Acer negundo*, was found to be stripped of its foliage by the larvæ of the

Lime-tree looper *Hibernia tiliaria*. On May 30th the larvæ were first seen and then were a half-inch in length. They fed voraciously and pupated about 18th June, one male moth emerging in confinement on 7th October. The moths of Tent caterpillars, probably *Clisiocampa fragilis*, which seems a very variable species, were noticed in abundance at two points north of Edmonton amongst the aspen, on 21st July, when they were just emerging from their cocoons. In several instances, two or three males were seen clustered on the cocoon from which females were apparently expected to emerge. Some larvæ of this species were taken at an earlier date south of Calgary from several of which *Tachina* flies emerged. About Regina, on 11th August, the weed *Chenopodium album* was noticed to have been destroyed by the larvæ of a small moth, not yet identified, many of the chrysalids of which, about a quarter-inch in length, were found in the withered remains of the leaves. Larvæ of the Beet moth, *Loxostege sticticalis*, were also prevalent on the same species of weed and in the same locality. These two last mentioned insects may, in this case, be looked on as beneficial in helping to destroy a weed responsible for considerable loss to the grain growers. At harvest time complaints were received of the Grain Aphis being so abundant on wheat north of Wapella that binders were stopped by the canvas slipping and the Aphids were removed by the shovelful.

While no appropriation is made by the Territorial Government for the control of insect pests, owing to the necessity not being forced upon them, a large amount of money is expended in the crusade against weeds officially proclaimed noxious. While, by legislative enactment, power is in the hands of the inspectors, fifty of whom are employed for a short period during the summer, to have a crop destroyed: it is seldom found necessary, the farmers being mostly willing to do their best to eradicate weeds when their attention is drawn to the appearance and the noxious character of such weeds as may be found in their crops or about their places. The estimated area cropped during the past season was over 1,800,000 acres and if even a fraction of a bushel per acre were the loss in yield sustained through weeds it will be seen that it would represent a sum of money well worth saving. Educational work is pushed close after settlement by means of institute meetings, bulletins and displays of mounted or green specimens of weeds. The difficulties that inspectors have to contend with are great, one being the fact that the population of some districts is of a very mixed character, as indicated by the fact that twelve distinct languages are spoken in one district within a radius of twenty-five miles. The early plowing of summer fallow and subsequent surface cultivation, followed by harrowing of the growing grain, is the method generally recommended for the subjection of annual weeds. Working of the soil in this way results in increased crops of grain, which well repay the labor. Spraying has been recently advocated by some, but is not looked on with favor by the most practical men and will probably never be adopted to any extent in the prairie country.

In many districts there is a perceptible improvement in the appearance of the fields since the inspection system was begun.

In the weed ordinance there is a clause which prohibits the sale for seed of grain containing seeds of noxious weeds, and this is quite an aid in preventing the spread of weeds, but unfortunately very dirty grain may be sold for feeding purposes without restriction.

Dr. Fletcher, in commenting on this paper, spoke in high terms of appreciation of Mr. Willing's work in the Northwest, having known him for many years, and having had many opportunities of observing his work and methods. Mr. Willing, he stated, has charge of all the weed inspection

and insect investigation in Assiniboia; he is an enthusiastic and capable man in his department, and an excellent collector. He has helped specialists in Entomology very much by procuring varieties, having, for instance, been the discoverer of *Apantesis Quensellii*, var. *turbans*.

Mr. Willing was educated in Ontario, and then went to the Northwest where he spent ten years on a farm and in ranching. He thus acquired a thorough knowledge of the country and became well prepared for his duties as inspector of weeds and insects throughout the Territory. Happily in that part of the Dominion the farmers are ready to accept and profit by the methods taught them by their instructors. In Ontario, on the contrary, the farmers have little respect for Entomologists and do not appreciate the value of their suggestions. The Northwest settlers came to the meetings from all directions to hear what he and Mr. Willing had to tell them and were anxious to learn all they could regarding such matters as the proper methods of fallowing, times for sowing, means of fighting weeds and insects, etc. He met with many young men in the Northwest who had come from the older Provinces with the intention of spending a year or two in the new country. It usually ended in their remaining there, and in almost every case they were doing well. Among these men he found a keen appreciation of this scientific work, and an eagerness to learn all they could about it. The farmers generally derived much benefit from the very good work that Mr. Willing was carrying on. He was also advancing the knowledge of plants and birds and insects in the schools, building up the Natural History Society, and in one way and another developing scientific methods and causing the farmers to adopt them. Dr. Fletcher concluded by saying that he was anxious to let the Society know how valuable a work Mr. Willing was carrying on in the Northwest, and how much it was appreciated there, and he also wished to express the gratification that all the members present felt that Mr. Willing should have undertaken so long a journey in order to participate in our annual meeting.

INJURIOUS INSECTS OF THE SEASON 1904.

BY PROF. W. LOCHHEAD, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

It is clear that the damage done by insects in 1904 has been below normal. The Pea Weevil, the Hessian Fly, and the Codling Moth, which wrought much damage in previous years, have not been very much in evidence this season. The causes which operated in the controlling of insect pests are difficult to understand. So far as 1903 and 1904 are concerned, however, we feel pretty certain that the climatic factors have had very much to do with the control of the number of injurious insects. The summers were cold and wet, which condition acts strongly on larval life. Sudden changes of temperature and moisture are very hurtful to larval existence, and it would seem that these causes were the main ones in controlling the injurious insects this season.

INSECTS OF THE ORCHARD.

Our Fruit Station experimenters do not report much injury from fruit insects this season. As a rule they term it an "off year". From Trenton, Mr. Dempsey reports that the Green Apple Aphis, the Pear-tree Psylla, the Plum Curculio, and the Codling Moth could readily be found, but no seri-

ous damage was done; at Walkerton, Mr. Sherrington reported few insect pests; Mr. L. Woolverton, at Grimbsy, says that the season is remarkably free from insect pests; Mr. A. W. Peart, of Burlington, mentions only the Curculio; Mr. Caston, of Craighurst, reports very few insects; Mr. Jones, of Maitland, mentions the Codling Moth as doing some injury, and states that very few insects were in evidence this season; Mr. M. Pettit, of Winona, reports the Curculio as being very bad; and Mr. Hilborn, of Leamington, had trouble with the Cherry Aphis and Peach Borers.

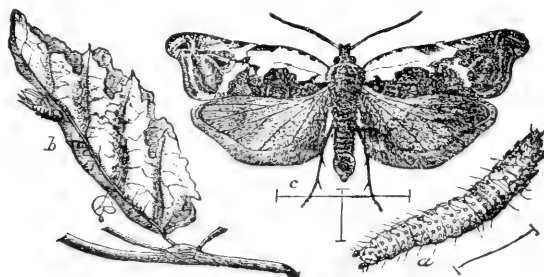


Fig. 5. Apple-leaf Sewer (magnified).

The Apple-Leaf Sewer (*Phoxopteris rubeculana*, Clem.) (Fig. 5), one of the Leaf-Rollers, was quite abundant, and did considerable damage in some orchards near Winona. In the orchards of Jos. Tweddle, Fruitland, which I visited, the lower leaves were practically free from this insect, but they were very prevalent in the topmost leaves. The owner informed me that before the trees were carefully and systematically sprayed nearly every leaf was infested, and he attributed the presence of the Sewer in the topmost leaves to the fact that it was almost impossible to treat properly the upper twigs of the very large trees.

The caterpillars (Fig. 5a) are about two-thirds of an inch in length when the leaves fall in autumn. In color they range from green to greenish yellow. There are two rows of light-colored spots beside the middle line of the back, and one or two along each side, each spot provided with a hair. Its head and shield of next segment are yellow.

The leaves are folded by using the silk threads which the caterpillar spins as draw-threads. The edges of the leaf are soon drawn together, which, when glued, form a hollow case. (Fig. 5b.) Within this case the caterpillar feeds upon the green tissue. Leaves frequently give indications of being tied or folded over at different times, according to growth of larva. Mr. Tweddle, always a careful orchardist and a strong believer in cleanliness about an orchard, believes that he can control this insect by thorough spraying in the summer with arsenite of lime.

The life history appears to be as follows: The winter is passed in the folded leaf as a larva; in early spring the larva transforms to a chrysalis, and in May the adult moths appear. Soon after, or in early June, the eggs are laid on the leaves, and caterpillars appear in a few days. Small folds are first observed, which do not involve the whole leaf, but finally the entire leaf is folded over. There is, thus, but one brood per year.

In the Fruitland district, the first brood of the Codling Moth was not so destructive as the second, although it damaged the Yellow Harvest, Astrachan, Duchess, and St. Lawrence varieties. The second brood of larvæ was abundant in August, and damaged the Baldwins and Greenings.

In other districts the Codling Moth was not very destructive.

The Plum and Apple Curculios were abundant throughout the Province. In the Winona district, where spraying was altogether neglected, the plum crop was very seriously damaged.

The Apple Curculio was most destructive in orchards that had been in sod for a period of years. In one orchard it was noticed that the pear trees in a row next to an open drain, which had not been cleaned out for some time, being full of leaves, etc., were badly attacked by the Curculio, while the trees in the centre of the orchard, where the ground had been cultivated, were entirely free from the pest.

The Peach Borer was reported as being abundant in several portions of the peach areas.

The Grape Thrips were unusually abundant in the vineyards of the Winona district. As a rule nothing was done to control them, and little harm seems to have been done by them.

INSECTS OF THE GARDEN.

The Raspberry Saw-Fly (*Monophadnus rubi*). This insect does not often call for attention, but this year reports came in early in June from a large grower near Fonthill that "numberless green larvæ were devouring the leaves of raspberries". An application of Paris Green put a stop to their ravages.

Wireworms did considerable damage near Burlington by destroying acres of melons and tomatoes. The plants would make a good start, but in a few days they would turn yellow and wilt. When such sickly-looking plants were pulled wireworms were found on the root stock.

Cabbage Root-Maggots continue their depredation year after year without apparent hindrance. Many growers of cabbages confine their patches to clay soil, for they found that nearly every plant succumbed on sandy soil. It seems strange that growers will not take the trouble to apply the tar-disk when the plants are set out, or to use one of the many solutions which are at least partially effective. They prefer to replant rather than go to the trouble and expense of using preventive measures.

The Onion Root Maggot was also very destructive this past season. This pest is even more difficult to treat than the Cabbage Root Maggot, but good results can be secured by the use of a solution of insect powder, or by Cook's Carbolic Wash.

The Carrot Rust-Fly (*Psila rosæ*) was severe at Barrie this season, and many specimens were sent to me which showed the characteristic rusty colored channels on the roots. This insect winters over in the ground in a puparium, and the winged flies emerge in spring to lay their eggs on the young carrots. Late sowing seems to be the most practicable treatment, for, although washes may be used to advantage, few growers will take the trouble to treat their carrots.

Currant Worms (*Nematus ribesii*) were very abundant on gooseberries and currants. Many cases are reported where the bushes were completely stripped of their leaves before the owner was aware of the presence of the worms.

Potato Beetles (*Doryphora decemlineata*) were reported as being more abundant than usual.

Asparagus Beetles are plentiful in the southwest section of the Province. The 12-spotted species (*Crioceris 12-punctata*) is by far the more abundant species, although in the Niagara region the other form is more numerous.

Red Currant Aphis (*Myzus ribis*) is one of the most common insect pests of gardens. The cause of the reddish-purple swelling of the leaf is not known by most people, but if they would only observe carefully and continuously the currant leaves, and watch the development of the swelling as well as the multiplication of plant lice, they would have no hesitation in concluding that the swelling is due to the punctures of the Aphids.

Lettuce Aphis was quite destructive in some greenhouses in the latter part of May.

Radish Maggots were very numerous in most sections. On heavy clay soil in the Berlin section they ruined the entire crop, but in lighter soil only about two-thirds of the crop.

The Strawberry Weevil. A correspondent from Oakville reported in early June that the Strawberry Weevils were abundant in that locality and had done considerable injury. The report said: "I notice that the beetles commit their depredations largely in the second year patches, the first year patches being comparatively free from their attacks. The damage done in this neighborhood is serious in some cases—in one case at least one-third of the blossoms have been nipped off. The 'Williams' variety which is largely grown here is suffering most". Specimens were sent me for identification, with a request as to best method of treatment.

The Strawberry Weevil is a very small snout beetle not more than one-tenth of an inch in length, with the snout about half as long as the body. There is but one brood a year, and the life-history seems to be about as follows: The adults winter over in protected places, and at the time of the first blossoming of the strawberries, usually about the 1st of June, they begin to appear in large numbers. The females puncture the buds of unopened blossoms and deposit an egg within; then to prevent the development of the bud, puncture or cut the stalk of the flower.

Larvæ appear in a few days, and these feed on the pollen. In about a month they reach full size, and in a cavity in the bud transform to pupæ. There the pupæ remain for about a week before becoming adults.

The work of the weevil is confined to pollen-bearing or staminate varieties, and the damage in due to the destruction of the pollen used in fertilizing the pistillate varieties.

The following methods of controlling this insect have been advocated:

1. *By covering the beds* with muslin or other light cloth a week before the first blossoms appear, and keeping them covered until the first berries are ripe.
2. *By cultivating pistillate varieties* which bear no pollen.
3. *By planting an early staminate variety* as a trap crop.
4. *By clean culture*.

It is probable that a good repellant would be an effective method of treatment, but more experiments are necessary to verify this point. Spraying with Paris Green is not effective as the beetles feed within the unopened bud.

INSECTS OF GARDEN ORNAMENTALS.

The Hollyhock Borer. In July many hollyhock stalks near the College broke down near the base. Upon examination every broken stalk had its pith tunnelled for about half way up by a large lepidopterous borer resembling a cutworm. On the side of the stalks holes could be seen through which the larva entered. At this time the borer was about an inch and a half in length, was smooth and cream colored; light brown and cream colored, stripes ran lengthwise of the body, with darker spots along spiracular area on each side.

The Aquilegia Borer. At the same time the Garden Aquilegias were being destroyed by a large borer which worked in the crown of the plant. The borer was about an inch and a half long, was reddish or pinkish color, with a white line down the middle of the back. I was unable to rear these borers to maturity. Dr. Bethune, to whom I mentioned the occurrence, is of the opinion that these borers are the larvæ of *Papaipema*, probably *P. purpurifascia*.

The Dahlia Stalk-Borer. On the 30th of June a correspondent from Strathroy wrote me as follows: "We raise a number of Dahlias and this year we are greatly troubled with a worm which bores a hole in the stalk and works upward and also downward inside the stalk. It is about three-quarters of an inch in circumference, brown in color with fine white stripes forming rings on the back and sides. Some may be completely ringed." On July 23rd, I received specimens of infested Dahlia stalks, with an added note that "the borer, early in the season, appears to work upward, but later downward, even to the bulb. As soon as we find a plant that has been bored, we make a slit in the stalk with a sharp knife, and follow either way till the borer is captured. The incision is then carefully drawn together and bound with soft rags. So far we have lost no plants entirely, although many have been attacked, and some plants several times".

The Primula Spring-Tail. Many florists find great difficulty in growing Chinese Primroses from seed. The seeds apparently germinate and are perfectly healthy, but in a short time the heads of the seedlings, that is the seed leaves, disappear. Frequently seedlings develop sufficiently far to produce the seed leaves, and when once they have reached this stage they have no difficulty in growing into Primrose plants. In the College greenhouse some of the germinating boxes in which were planted Primrose seed, developed quite normally, while in boxes close by the young seedlings did not develop very far before they disappeared. It occurred to the florist, Mr. W. Hunt, that the cause of the trouble was some insect pest. On examination I found that the surface of the soil of the germinating boxes contained immense numbers of minute Spring-Tails. It is usually stated in text books that the Spring-Tails do no damage to the plants. Dr. J. B. Smith, in his "Economic Entomology", writes as follows regarding Spring-Tails: "Spring-Tails are found in moist localities, wherever decaying matter occurs. In manure beds they often occur in millions, and on warm days may come to the surface in astonishing numbers. They are often found in damp cellars on any vegetable matter stored there, and are sometimes accused of promoting decay. As a matter of fact, these insects are never injurious. Healthy vegetable tissue is not attacked by them, and their mouth parts are adapted for food of moist or soft tissue only, hence a decaying or bleeding spot attracts them. They are sure to occur on manure and on manured land".

Suspecting Spring-Tails of gnawing off the leaves of the Chinese Primroses, we planted some more germinating boxes in the hope that we might be able to settle the matter, and the boxes were kept in the Biological laboratory, where it was under constant observation. Although I was not able to detect the Spring-Tails at work on the seed leaves, yet if they are found on soft vegetable tissues I see no reason why they might not develop a taste for the young seed leaves. Experiments will be conducted later to find out the best way of treating infested soil. It is very probable that some mineral or commercial fertilizer will act as a repellent, and keep the soil free from these tiny pests.

SOME HOUSEHOLD PESTS.

It would appear as if the Buffalo Carpet Beetle (Fig. 6) was gradually extending its sphere of operations in Ontario. Reports reach me from widely separated points of its presence in injurious numbers, and requests are freely asked for the best remedies. This insect is not an easy one to control, and only long continued persistent efforts will eradicate it. First of all the carpets should be taken up, thoroughly beaten, and it would be advisable to spray these with benzine while they are out of doors. The bare floors should be swept and dusted and washed with hot water. Careful attention should be given to the cracks in the floor, and it would be well to pour some benzine into the cracks, then, after it has evaporated, to fill up these cracks with putty or plaster of Paris. The cracks are the best breeding places for the insect, and these should be done away with if possible. Rugs should be used rather than carpet, for experience shows that the edge of the carpet is most liable to injury from the attacks of this insect. In rooms where the Carpet Beetle has effected an entrance, it would be well to leave the edges of the carpet free, so that they may be examined freely at intervals. If the house-keeper carries out the measures which I have indicated, she will have little trouble from the operations of the Carpet Beetle.

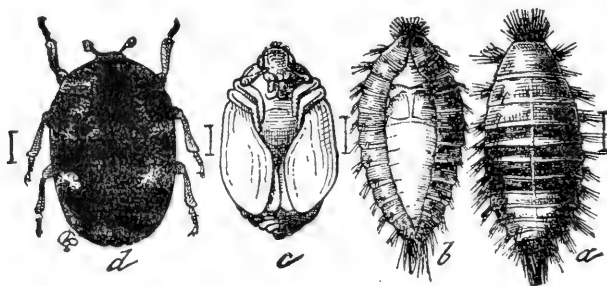


Fig. 6. Buffalo Beetle; *a* larva (destructive stage); *b* pupa within larva skin; *c* pupa; *d* beetle—all much magnified.

Powder Post Beetle. This minute beetle belongs to the genus *Lyctus*. It is more or less common throughout the Province, and many inquiries have been made during the past season as to the name of the insect which is converting some of the oldest and most valuable furniture into powder. The cause of the injury is a minute beetle called the Powder Post Beetle. It not only is injurious to old house furniture, but it is an insect to be dreaded by wood workers generally. This minute beetle passes the winter in the wood, and the eggs are deposited in the spring. The grubs, on hatching from the egg, begin to operate in all directions through the wood. There they remain until full grown and transform to the pupa stage, and in a short time afterwards they emerge as adult beetles. It is probable that there is but one brood annually. These insects prefer very dry wood material. The best methods of treatment for this particular insect are: First, to subject infested timber to a thorough steaming in a tight room, or to a very high temperature in a kiln, or to make applications of coal oil or benzine to the infested parts. I have advocated the use of hydro-cyanic acid gas.

Mites in Flour. Occasionally packages of flour have been sent in which showed the presence of Mites. Naturally the house-keeper is averse to using flour containing Mites, and inquiries are made as to the best method

of dealing with infested flour. These Mites are the common *Tyroglyphus longior*. I have recommended the thorough cleaning of the flour bin as one of the first essentials. If the owner does not care to throw out his flour or use it for other purposes, he may fumigate it with carbon bisulphide or hydro-cyanic acid gas. After thorough ventilation there is no danger whatever from poisoning due to the use of either of these chemicals.

SOME BOT FLIES OF OUR SMALLER MAMMALS.

Two interesting cases of infestation by bot-fly larvæ came under my notice this summer. The first was that of a kitten which had a large growth on the neck. Upon opening the growth a large bot maggot was taken, which measured more than an inch in length and more than half an inch in diameter. The second case occurred on a rabbit which had a tumor-like growth on the neck.

There seems little doubt that the larva taken from the rabbit is *Cuterebra cuniculi*, Clark, (Rabbit Bot-Fly), and as the form taken from the kitten's neck is very similar, it is probable that it is the same or a very closely allied species.

The Rabbit Bot-Fly (adult) is quite large, and resembles to some extent a bumble-bee. Its head is black, the upper surface of its thorax is yellowish and hairy, and its abdomen blue-black, with the exception of the first segment which is covered with yellow hair.

The larva, as will be seen by an examination of the specimen is a large, black spiny maggot. It has two small hooks at the anterior end by means of which it can cling to linings. It is sometimes stated that bots which live in tumors have no oral hooks but only fleshy tubercles. The rows of spines no doubt serve in locomotion.

All the larvæ of bot-flies descend to the ground, where they burrow to some extent. There they transform to pupæ within a puparium, and remain as such until spring, when the adult flies emerge. The adults are very conspicuous insects, and are fond of sunshine.

Osborne states that the egg and early larval stages of this bot-fly are unknown. Much investigation has been done with regard to the bot-flies, which are parasitic on our large domestic animals, such as sheep, cow, and horse, but very few studies of importance have been carried on with the bots which parasitize our common wild animals. Every observation is of value, hence for this reason I have presented these notes.

RECENT EXPERIMENTS AGAINST THE SAN JOSE SCALE.

BY PROF. W. LOCHHEAD, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

In the last report of the Entomological Society I called attention to the excellent results which were being obtained by the use of the lime-sulphur wash. The great objection against the general adoption of this wash was the difficulty of preparation and of application. It was noted, however, by many of the fruit-growers who prepared this wash in large quantities that it was not so difficult to prepare as was anticipated.

Occasional experiments had been conducted last year to determine if it were possible to prepare the lime-sulphur wash without the prolonged boil-

ing that was necessary. Early in the spring Dr. E. P. Felt, State Entomologist at Albany, New York, asked me to try the following mixture:

Lime	25 pounds
Sulphur (flowers)	20 pounds
Sal soda	12½ pounds
Water	1 barrel

The method of preparation was as follows: Put five or six pails of hot water into a wooden barrel, add the lime quickly following the sulphur and sal soda, and stir until the slaking is practically completed. It may be necessary to add a little cold water at intervals to keep the mixture from boiling over. After the violent action has ceased, cover the barrel to retain the heat, and allow to stand from 15 to 30 minutes. Dilute to the full quantity and apply.

After advice from the Department at Toronto, Prof. Harcourt and myself were urged to test not only the above formula but also another lime-sulphur wash in which caustic soda is used, the formula being:

Lime	30 pounds
Sulphur (flowers)	15 pounds
Caustic soda	5 pounds
Water.....	1 barrel

The method of preparation was as follows: Slake two-thirds of the lime with water enough to prevent either burning or drowning, and during the process sift over and stir in one-half the sulphur, then add the remainder of the lime and more water, and as the boiling continues stir in the balance of the sulphur, adding water as needed, stirring to help the combination. While the mixture is still steaming add one-third of the caustic soda, which will cause violent boiling, and before this is over add another third. If then the mixture has not reached a brick red color add the remainder, and after standing for a time dilute to the required amount. The formula was first tried by the Experiment Station at Geneva, and is, consequently, known as the Geneva Formula.

Prof. Harcourt and myself, acting in co-operation with a special committee appointed by the Niagara Fruit Growers' Association, made arrangements to test the two lime-sulphur mixtures. The first experiment was tried in the orchard of W. H. Bunting. The application was made on the 23rd of April. The trees were not over thrifty and were well covered with scale. Next, one barrel of the lime-sulphur sal soda wash, was applied on trees in the orchard of Geo. Robertson, two trees of which were badly infested. One barrel of same mixture was applied on several badly infested trees in W. C. McCalla's orchard, and one barrel of the same mixture in Mr. Griffith's orchard, one tree of which was badly infested. A barrel of each kind of wash was applied on badly infested trees in the orchards of Messrs. Secord, Titterington, and McArdle.

In the preparation of both of these mixtures there was little trouble in obtaining the characteristic amber color of the well boiled lime-sulphur combination, but it was found that quick slaking lime should be used and that too much water should not be present, and that with hot water better boiling is secured with probably better results.

These orchards were visited in July and August by the committee and ourselves, and in every case little or no difference could be seen in the numbers of living scale on the trees sprayed with these mixtures and those sprayed with the usual boiled-lime-sulphur wash. Dr. Felt, in a recent letter, reports that excellent results have been obtained from this season's work with

the lime-sulphur sal-soda wash. The ease with which these mixtures can be prepared will greatly recommend them to the small fruit grower who has not sufficient trees to warrant the installing of a steam boiler plant.

In the discussion that followed the reading of this paper it was stated that the "McBain Mixture" was too expensive, as it cost \$2.50 per barrel, while the lime-sulphur only cost sixty cents. Comparisons had been made by treating alternate rows of trees with the two compounds. When examined in the middle of July, no difference could be observed and there were badly infested trees in each row; the same condition was found in August and again in September. As a result it seems that the one mixture is just as effective as the other, and consequently the expensive one is out of the market. At the last inspection some live larvæ of scale were still found on trees which had been badly infested at the outset. The lime-sulphur mixture was made with 15 pounds of the former and 17 pounds of the latter, and boiled about an hour by which time it had reached the red amber color stage.

EVENING SESSION.

A public meeting of the Society, to which the people of London were invited, was held in the Normal School on Wednesday evening, October 26th, by kind permission of Principal Merchant. Though the weather was inclement, a rainy afternoon being followed by the first snow of the season, the attendance was very good and the lecture-room was well filled. At eight o'clock the chair was taken by Dr. James Fletcher, Entomologist and Botanist of the Dominion Experimental Farms; after a few introductory remarks he called upon Professor Lochhead to deliver his address, as President of the Society.

RECENT PROGRESS IN ENTOMOLOGY.

(Annual address of the President.)

By WM. LOCHHEAD, B.A., M.S., PROFESSOR OF BIOLOGY, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

Another eventful year in the history of the Entomological Society of Ontario has just passed, and we are met again to exchange greetings, and to gather information through the exchange of opinions and the reporting of observations. The Annual Meeting of our active members, all interested in a common cause, cannot help but be a tonic in its effect. We return to our separate fields of work stimulated to renewed activity, and refreshed by the mutual exchange of opinions.

While encouraged by the meeting of so many of our members, we are also saddened by the thought that one of our oldest and most active members has passed away since our last meeting. Mr. J. Alston Moffat, our elder brother, is no longer here to welcome us to our own home. For fourteen years Mr. Moffat was Curator and Librarian of our Society, and for more than thirty years was an active worker in the field of Entomology. He died on Friday,

February 26th, after an illness of six months. His services for us will be long remembered, and his kind attention will not soon be forgotten by those who had occasion to use the collections and books of the Society.

I am sure we were all pleased when Dr. Bethune consented to assume the duties of Librarian and Curator, in addition to his other duties as Editor of the *Canadian Entomologist*.

It is the privilege of the President to review the progress of Entomology, and to note the chief entomological contributions of the past year. In my last year's address I reviewed the progress of Economic Entomology in Ontario during the last fifty years. It is unnecessary to state at the outset that it is impossible to deal with Ontario or Canada apart from our great neighbor to the south of us. In Entomology, as in other branches of science, the two countries are one, and there are no boundaries between them. The very fact that some of the prominent United States entomologists are present at our Annual Meetings, and some of our members at theirs is strong evidence that we are working together to the same end. On account, however, of their vastly greater appropriations and facilities for entomological investigations, they have taken the lead, and we have come to look to them for both inspiration and suggestion in the prosecution of our work.

Great problems have come up for solution in the last few years both in Canada and United States. The first problem to which I shall refer was the control of the San Jose Scale. Hundreds of investigators have been studying this insect with the object of finding simple, effective methods of destroying it. During the progress of the investigations many new insecticides have been tried, and new spraying machinery has been contrived, with the result that our knowledge of insecticides has greatly increased. Among the many insecticides prepared, one in particular may be mentioned on account of its cheapness and effectiveness. This is the *lime-sulphur solution*, which is now almost universally used in controlling the scale. Incidentally, also, it was found that it possessed fungicidal properties of great value, and it is now possible to control the *Peach leaf-curl* at the same time that the scale is treated.

Experiments are now in progress to find an easier method of preparing the lime-sulphur solution, which many fruit-growers' found difficult to make.

It would appear that many important additions to our knowledge of insecticides and fungicides may be looked for in the near future, for the entomologist is now working in co-operation with the chemist and physiologist.

The second problem to which much attention is now being given, is the determining of the value of parasites in the controlling of injurious insects. As you all know, there are entomologists who believe that there is no need of spraying to control insects. They bring forward the evident fact that a balance is maintained in wild nature, through the operation of parasites and predaceous animals when there is a limited food supply, and that man has interfered with the order of things by his clearing of the land and his planting of large areas, and by his ruthless destruction of birds and other animals which prey upon injurious forms. These entomologists believe that in time, the *balance* would again be established; that the beneficial forms would keep the injurious forms under control. The main objection to this argument is that the establishing of this *balance* is slow, too slow for the farmer and gardener who would lose heavily during the return swing of the balance.

Moreover, when foreign pests are the disturbers of the balance, many years may be required to bring them under control, for it is well-known that predaceous forms tend to leave foreign pests severely alone; they have, as it were, an aversion to imported food. It becomes necessary then, in such

cases, to import the insects which prey upon the pest in its foreign home. There have been two or three signal successes in this direction. The first and best known was the importation of the Australian lady-bird *Vedalia cardinalis* for the purpose of preying upon the *Fluted or Cottony Cushion Scale* of the orange groves of Southern California. After a careful study it was found that this scale had come from Australia and there it is not particularly destructive. There it is preyed upon by several predaceous insects, and it was thought advisable to import these and to place them among the infested orange groves. One of these lady-birds soon increased rapidly in numbers, because it preyed upon the *Cottony Cushion Scale*, and saved the orange groves.

The second successful case not so well-known is that of the South African parasite of the Black Scale, *Lecanium oleæ*, which infests the olive and orange trees of California. This parasite known as *Scutellista cyanea*, a species of fly, was imported from South Africa, first to Louisiana, afterwards to California, where it has done wonderful work against the Black Scale. The larva of *Scutellista* feeds entirely on the eggs of the scale, and a study of its habits shows that it is admirably adapted for the control of the Scale. Its resting period occurs when the Black Scale is resting in the larval stage; consequently the absence of the food supply of eggs at this time does not interfere with its development. The fly has now become widely spread, and the olive and citron orchards have been fairly well cleared of the scale which threatened their destruction. Arrangements are now made for the breeding of the *Scutellista* at Los Angeles, and for the distribution of colonies to infested ranches.

The third case of importation is that of the Chinese Lady-bird *Chilocorus similis*, for the control of the San Jose Scale. It will be remembered that Mr. C. L. Marlatt, Assistant Entomologist at Washington, was despatched to Japan and China about three years ago to learn more about the habits and distribution of the San Jose Scale in those countries. After a careful survey of many parts of Japan, Mr. Marlatt was satisfied that Japan was not the original home of the scale. He proceeded to China, and in the Pekin markets he found scale readily on fruit raised in the region south of the Great Wall. Further examination revealed several forms which preyed upon the scale and kept it in check. One of these predaceous forms was a lady bird, and this one appeared to be doing most to control it. He sent a large number back to Washington, but unfortunately only a few survived. By careful breeding, however, these multiplied, and in time small supplies were sent to different States for liberation in orchards infested with the San Jose Scale. Up to the present time the Lady-birds have not done well, with the exception of those sent to some Georgia orchards.

The fourth and last experiment of this nature to which I shall refer is the recent introduction of a Guatemalan ant, called the *Kelep*, to prey upon the Cotton-Boll-Weevil of the cotton plantations of the South. This species of ant was discovered in Guatemala, where it "attacks and kills the adult boll-weevil thus permitting the regular harvesting of a crop of cotton, even under conditions favorable to the weevil. It is carnivorous and predaceous; it injures no form of vegetation and takes nothing from the cotton plant except the nectar secreted for it on the leaves and floral envelopes." It stings and paralyzes the weevil and frequently tears the weevil to pieces. Colonies of this ant have been established in Texas, but recent reports are not encouraging.

It will be seen, therefore, that we can already point to some cases of successful application of predaceous and parasitic insects to the control of inju-

rious forms, but it must be confessed that the number of such cases is remarkably small. Too frequently in popular talks and newspaper articles the exceptional cases are referred to at such length and in such terms, that the impression given is that all injurious forms can be controlled in such a manner. So far is it contrary to the facts of the case that man must depend largely upon other means of saving his crops. I do not wish to leave the impression that parasitic and predaceous insects do not perform a very important function in holding injurious forms in check. I know that facts point otherwise, but we must not fold our arms and lull ourselves by the sweet delusion that all will be well with our crops, for the parasites will look after the insects which would do injury.

Reference must be made to the great interest that has arisen with regard to Mosquitoes and the Cotton Boll-weevil across the border. With regard to the latter insect, we Canadians, can do nothing directly, as cotton is not grown within our borders, but we should not be uninterested spectators in a struggle against an insect which threatens the cotton industry of the United States. We have cotton mills in Canada, and are dependent to a large extent for our raw supplies on the Southern States. A reduction of the cotton crop there would mean a rapid rise in the price of cotton goods in this country. We also know that Great Britain would suffer very heavily by a shortage of the cotton crop in the United States.

The Department of Entomology at Washington has been called upon for help in the fight with the Cotton-Boll-Weevil, and Dr. Howard is now conducting the campaign. A large appropriation has been placed at his disposal, and the outlook is quite encouraging.

It has been shown that with new cultural methods the weevil can be controlled. That the apparent evil may turn out a blessing is very probable. It may lead to a better system of cotton growing, which is desirable in many parts of the South.

The Mosquito question is one that is largely discussed in the Eastern and Southern Atlantic States, for these troublesome pests have always been most annoying and deadly in the neighborhood of the Great Cities of the coast. The Entomologists have shown by patient investigation that malaria and yellow fever are due to the bites of certain mosquitoes, viz., *Anopheles punctipennis* and *Stegomyia fasciata*. In the case of malaria the insect becomes infected by sucking the blood from an infected human being. The malarial organism, having thus entered the stomach of the mosquito, passes through certain changes of its existence in the body of the insect, and at the end of about eight days reaches the poison gland. After this time, if the mosquito bites another human being, the malarial organism is introduced into the circulation of the latter, and malarial fever follows. The organism causing malarial fever (the *Plasmodium malaria*) is the true parasite, and so far as we know finds the conditions necessary for its existence only in the human blood and this species of mosquito.

On to the relation between Yellow Fever and *Stegomyia fasciata*, I need not now enter into a discussion, for Dr. Howard dealt very fully with this subject in his address at our last Annual Meeting at Ottawa.

Although the Yellow Fever Mosquito is not with us, the Malarial Mosquito, and several other species are far too common in early summer in some localities, where they make life a burden by their continuous tormenting stings. (Fig. 7). Individually and as a Society we might do much to improve the conditions of living in mosquito-infested districts. We might emulate our friends across the line and form a *Mosquito Extermination Society*. This Society should enlist in its membership all persons interested

in this important matter, should place and carry out means of extermination, should secure information regarding the distribution of mosquitoes in this country, and disseminate information throughout the infested areas. It has been proved that mosquitoes can be exterminated from an infested locality by a thorough drainage of the meadows and swamps, and by careful attention to standing water in pools, ditches, ponds, tanks, cisterns, wells, cess-pools, so as to have them drained or covered.

On account of the great importance of the subject, I would suggest that our Society take measures to begin an active anti-mosquito campaign. Much could be done during the coming year to call the attention of the public to the fact that mosquitoes can be exterminated, and I am sure that our public men throughout the country would come to our aid as soon as practicable propositions were laid before them. As Dr. Howard says: "When we consider the enormous sums of money spent for luxuries, how much more should be spent for bare comfort and peace!"

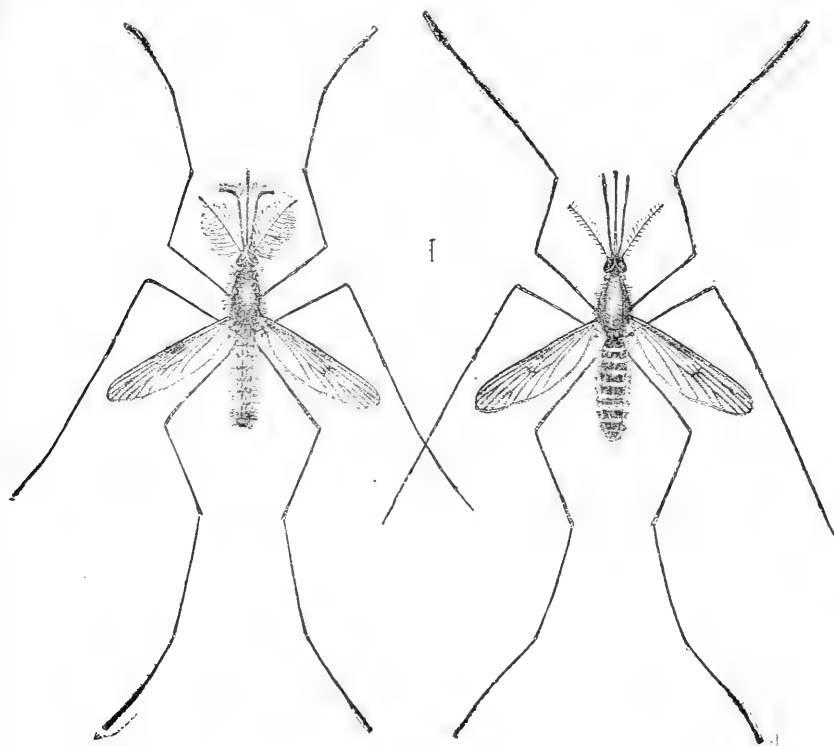


FIG. 7. Malarial Mosquito (*Anopheles*), male on left, female on right hand of figure.

The last illustration of Entomological work of great importance is the successful introduction of the Caprifig insect (*Blastophaga grossorum*) from Southern Europe for the fertilization of the Smyrna figs in California. For some years attempts had been made to produce Smyrna figs in California, but without success. The failure was due to the fact that the flowers of these figs were all female, and there was no natural mode of pollination. It is well known that the fine flavor of the figs imported from Smyrna is due to the fact that the fig flowers there are fertilized by pollen from the Wild Caprifig. When branches of the Wild Caprifig bearing figs are tied to branches of the

Smyrna fig tree an insect emerges from galls within the former and pollinates the female flowers of the latter.

After much labor the *Blastophaga* has now been successfully introduced into the fig orchards of California, where both *Caprifig* and *Smyrna fig* trees thrive as well as they do in Asia Minor, and successful means have been adopted for the caprification of the *Smyrna figs*. The value of this experiment to the United States will be above one million dollars a year.

As I have already stated, much work is being carried on to determine the value of insecticides other than Paris Green. Reference has already been made to the lime-sulphur solution which is now used extensively against the San Jose Scale. So effective is this insecticide that the fruit-grower may be said to have the scale at his mercy, and it will only flourish where the fruit-grower is indifferent and will not spray.

Experiments were carried on this year in the St. Catharines district by Prof. Harcourt of the Agricultural College and myself, in co-operation with a committee of the Niagara Fruit Growers' Association to determine the value of the lime-sulphur-soda mixture against the San Jose Scale. This mixture does not require boiling, hence is more readily prepared than the lime-sulphur mixture, now in common use in scale-infested orchards. It was prepared as follows: 20 pounds sulphur were stirred into hot water at the bottom of a barrel; 25 pounds of quick lime and 12 pounds of sal soda were put in and hot water added as needed. After thorough stirring the whole was covered and left for at least half an hour. When required for use dilute to 40 gallons. The results were quite satisfactory, and gave about as good results as were secured from the use of the lime-sulphur mixture.

Another lime-sulphur-soda mixture was also tried, caustic soda being used instead of sal soda. The formula is:

Lime.....	30 pounds
Sulphur	15 pounds
Caustic soda	5 pounds
Water.....	40 gallons

In some localities *arsenite of lime* has been used extensively instead of Paris Green alone and with Bordeaux Mixture, when a combination insecticide and fungicide is required.

Arsenite of lime has been proven to be a very effective insecticide. It is prepared by boiling 1 pound of white arsenic and two pounds of lime in two gallons of water for 40 minutes, and when required for use 1 quart to a barrel of water. As white arsenic is cheaper than Paris Green this preparation is to be preferred to the latter.

The Kedzie Mixture or *Arsenite of soda*, known for some years, is even a better mixture than the arsenite of lime. It is prepared by boiling 1 pound of white arsenic, 4 pounds of sal soda in two gallons of water for 15 minutes, until a clear solution is obtained. When required for use take 1½ quarts of this solution, 4 pounds of freshly slaked lime and add to a barrel of water. It can also be used with Bordeaux Mixture.

Another arsenic compound has also come rapidly into general use, viz., *arsenate of lead*. This insecticide was tried and found effective in Massachusetts a few years ago in the fight against the Gypsy Moth. The formula is:

Arsenate of soda	4 ounces
Acetate of lead	11 ounces
Water	150 gallons.

The arsenate of soda is dissolved in 2 quarts, and the acetate of lead in 4 quarts of warm water, then added to the 150 gallons of water.

As a rule most of our insecticides are applied in the liquid form, but within the last two years dust-sprayers have been used in some orchards. The value of dust-sprays is not definitely known; some experimenters openly oppose their application on the ground that they are not nearly so effective as the liquid sprays, while other experimenters strongly advocate their use. It is possible that dust-sprays can be used to advantage in wet weather when the foliage is wet and the ground is too soft to allow the heavy liquid spray outfits to be employed.

I must not conclude this address without referring to the educational side of the work of this Society. In the first place, it is the duty of the Society to take the lead in educating the public as to the best means of combatting the insects which prey upon the products of the country. This must be done intelligently; by this I mean that in any treatment the *why* as well as the *how* should be kept in mind. Recent insect scourges have done much to educate the producers of the country; but it must be acknowledged that even in the presence of these enormous annual losses the farmers, as a body, stand apathetic. They will take action on minor matters which involve only a few hundreds of dollars, but will do nothing when thousands of dollars worth of products are involved. As a community, the farmers of Ontario require to be wakened up to the tremendous losses they are annually sustaining. They are making many efforts to cheapen production and to cheapen transportation, but what efforts have they made to prevent these tremendous annual losses of millions of dollars? Education is required. Surely, it is not too much to expect the farmer who has to deal with enemies which produce such a loss to acquaint himself with the habits of the pests which work him so much injury.

Many of our most prominent fruit-growers have become experimenters, and an experimenter, you know, is usually a live, wide-awake man, with great influence in his community. The members of this Society should esteem it a privilege to help along the good work of enlightening the people regarding the wonderful world of insect life. The Department of Agriculture is generous to us, and, what is better, is sympathetic. It understands the difficulties of our work, and knows how small the army of workers is. It expects, however, every member to do his duty, for it must give an account to the public of the sum placed at our disposal.

Prof. Slingerland, in a recent article in the *Cornell Countryman*, advances a powerful argument for a better diffusion of insect knowledge. He shows that "it costs the New York farmers more than twice as much to feed their insect foes as it does to pay their share of the cost of maintaining the schools for educating their children." If this is true for New York State, it is equally true for Ontario. Arguments like this one are needed to make the farmer take an interest in a matter which is vital to his welfare.

In the second place, this Society should take a leading part in the new educational movement, called Nature-study, and help to usher in the time when every child will have an acquaintance with his surroundings and take pleasure in the world of Nature which a beneficent Creator has provided; when the method of instruction in our schools will be more rational; and when the schools will send forth students equipped for their life work, prepared for complete living.

Power as well as culture should be the result of our education, for "education for culture alone tends to isolate the individual, while education for sympathy with one's environment tends to make the individual an integral part of the activities and progress of its time."

The study of insect-life we entomologists believe to be a valuable Nature Study. It is interesting; it is a practical study, that is, one which can be

carried on without much expense; and it is a study which, perhaps better than most others, gives the student a conception of the wonderful inter-relationship of organisms. Let us hasten the time, therefore, when the teachers in our schools will be able to use the abundance of insect life about them in the education of their pupils.

After the conclusion of the President's Address, Professor H. F. Wickham, of the State University of Iowa, Iowa City, one of the Honorary Members of the Entomological Society of Ontario, gave a very interesting address, illustrated with a large number of lantern slides, made from photographs which he had taken at the various localities referred to. The following is an abstract of his address:

INSECT DISTRIBUTION IN THE GREAT BASIN CONSIDERED IN THE LIGHT OF ITS GEOLOGICAL HISTORY.

By H. F. WICKHAM, IOWA CITY, IOWA.

In the discussion of the problem of the present distribution of animals on the earth's surface, the influence of the better marked features in the geological history have been widely recognized. It is well known, for instance, that an island lying far out to sea and separated from other land areas for vast periods of time will be inhabited by an assemblage of animals quite distinct from those of other regions—and in general, it may be said that the length of time during which this island has been thus separated, and the completeness of its isolation are the principal determining factors in the development of a peculiar fauna. Temperature, climate, chemical nature of soil and water, together with numberless other physical conditions, all conspire to work on organisms with the result of constant, though often slow change—until in the course of numberless generations the members of the isolated colony present an assemblage of characters quite different from those possessed by their relatives elsewhere. The occurrence of beetles on the high peaks of the Rocky Mountains, and on the summits of Mounts Washington and Katahdin, whose nearest allies are characteristic of the cold plains of the far north, has been explained in the light of our knowledge of the great southward movement of the ice in remote times. The ancestors of these stranded insects fled to the south in front of the advance of the tremendous glaciers. When these finally melted, their borders, retreating northward, were followed by the beetles which flourished in the cool climate of the edge of the ice-sheet; but some of the individuals sought to escape the ever increasing heat by ascending the mountains. Where these were high enough to furnish proper climatic conditions for the colony thus formed, communities have been carried through to the present day, and the collector may find on the summit of the highest Rockies the identical species that he catches on the frozen shores of Labrador, though the intervening valleys of the United States and southern Canada will not furnish him a single specimen.

Another well known characteristic of insect life, is the tendency of successful species—those which are in such perfect harmony with their surroundings that the increase in number is very rapid—to spread, and to invade new territory. Where this spread is natural, that is to say, not dependent on human agency, it usually takes place along definite lines. These lines are determined by various conditions, depending on the nature of the insect, as well as on the country which it is invading. Some are very sensitive to

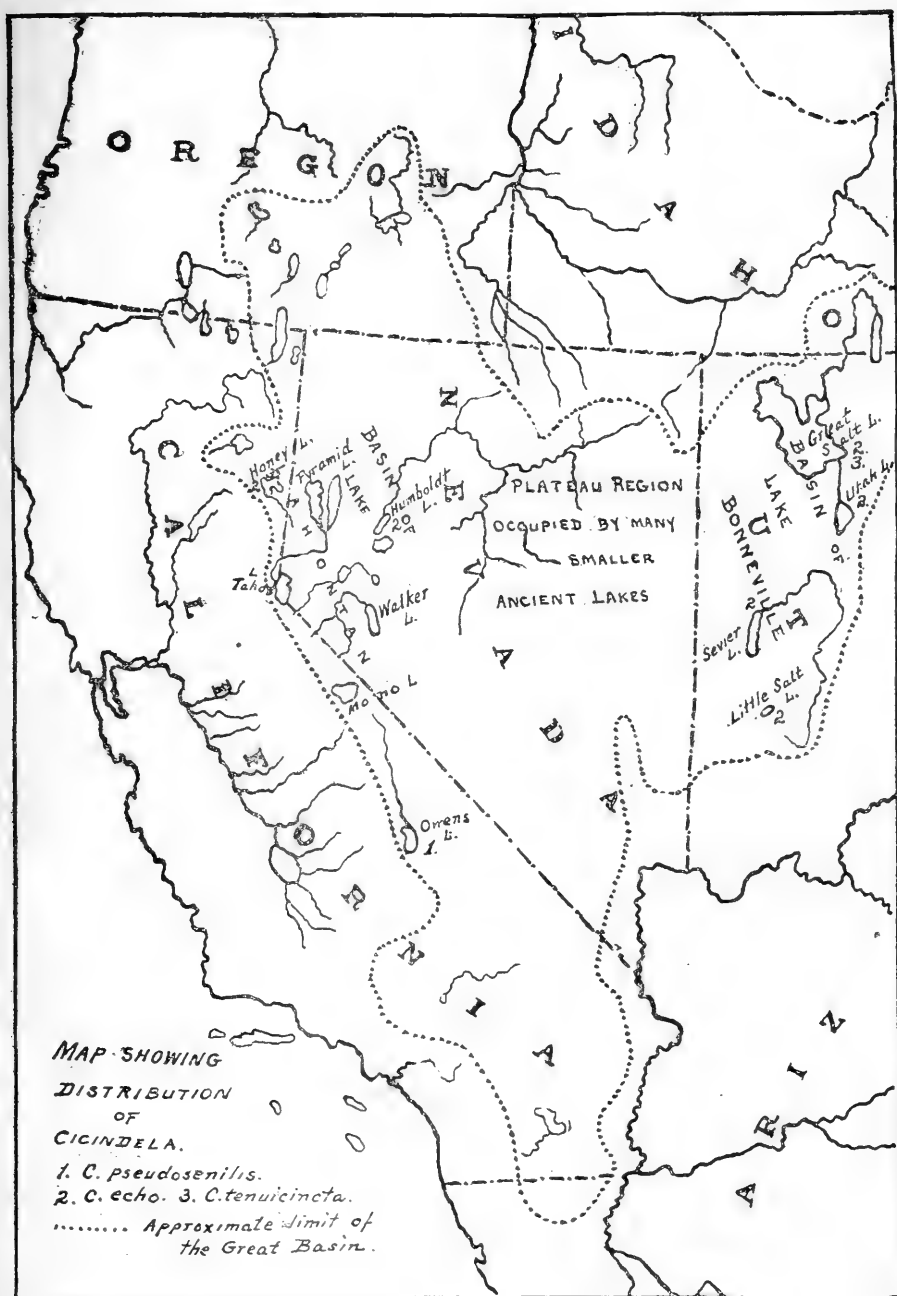


Fig. 8. Map of the Great Basin.

climatic changes, and are limited in their distribution by the isothermal lines or by the extent of rainfall. Thus, a desert may prove impassable for one species, while another may be equally unable to surmount the barrier presented by a low swampy tract, a high mountain range or a great plateau. The valley of a large river, with its gradual slope and protected nooks, forms a natural highway for the passage of migrating or spreading species.

Within the Great Basin of North America, certain problems of insect distribution are presented in almost perfect purity. In these desolate areas and spots rarely trodden by the foot of man, still supporting the life that has been theirs since the time when the valleys were filled with lakes that have left their tide-marks and old beach lines hundreds of feet up the sides of the Wasatch and the Sierra Nevada; inland seas of fresh water, gradually dwindling away as the result of widespread climatic changes, and now represented only by the few meagre salt and bitter lakes that mark the bottom of the ancient bed. Even these remnants are in danger of disappearance through the loss of their tributaries, diverted for irrigation, so that if we are to study the insects peculiar to their borders the work should not be delayed.

The Great Basin lies between the Wasatch and the Sierra Nevada. It includes the western part of Utah, nearly all of Nevada, a great part of eastern and southern California, extending a short distance down the Peninsula. It also takes in a portion of southern Oregon, and small sections of Idaho and Wyoming. Though termed the Basin, it is chiefly high plateau, fringed by still higher mountains, whose outer slopes drain into the Colorado and the Columbia, excepting along the western edge where the surplus rainfall is gathered up by the Sacramento and other rivers that discharge more directly into the Pacific Ocean. The moisture which falls within the limits of the Great Basin, however, can escape only in one way, namely by evaporation. None of the streams rising there ever break through the rim nor reach the ocean. The rivers either waste away on the vast deserts or empty their floods into shallow lakes that act as evaporating pans, precipitating the solid matters and returning the rest to the air again. As a consequence of this continual concentrating of the fluids, the waters of the lakes are nearly all strongly alkaline or saline, often so bitter as to be useless for drink. The shores are incrustated with salt and soda, sometimes the deposits are several inches in thickness. These beaches, in spite of their forbidding appearance, support a life peculiar to themselves—they are inhabited by an assemblage of insects fitted for just such conditions, and existing nowhere else.

The lakes are separated by immense tracts of desert—black volcanic rock, old hard-baked mud flats or wide valleys of sand, according to the forces that have been at work in the making of the land. Much of the valley country is in the neighborhood of five thousand feet above the sea, but it falls off to the southwest where it occasionally sinks several hundred feet below the level of the ocean. In the northern part, the climate is moderate, in the southwest it is extremely hot, but certain features are common to the district as a whole—the air is very dry and the rainfall scanty, so there is a constant, though not regular, dwindling of the water bodies. The plant life is essentially that of the desert except on the higher mountain ranges where the trees occasionally reach a profusion of growth which we may call forest.

It is, however, with the insects that we are mostly concerned, and of the insects we are best acquainted with the Coleoptera. Several types are quite characteristic of the Basin, hardly occurring outside of it, or at most barely passing the borders. In this category, may be mentioned *Cicindela echo*, a fine tiger beetle; *Cicindela tenuicincta*; *Tanarthrus salicola* and its allies, small species frequenting the borders of alkaline lakes and ponds; three hairy

Eleodes, circus bugs as they are called in the West; and a considerable number of the genus *Bembidium*, ground beetles that pick up a living on the shores of streams and pools, not dwelling at any considerable distance from moisture. Many others might be named, but I have endeavored to call attention only to a few of the more striking instances.

In studying the shore-inhabiting species just mentioned, the question has arisen, whence do they owe their origin? Are they immigrants from the surrounding lands, and if so, do they come from the north or south, the east or west? Do they have near allies on the shores of lakes lying outside of the Great Basin, or are they isolated types that may be supposed to have arisen on the ground they now occupy? My own belief, founded on several years' work with material collected on my trips to nearly every part of the Great Basin and the surrounding districts, is that they are true endemics—that they have undoubtedly arisen, as species, in their present locations or the immediate vicinity thereof. Occasionally a small colony may be established in the outlying districts adjacent to the Basin, but such cases are rare. A study of the distribution of some of the principal types, will, in my mind, cast a good deal of light on the question as to whether or not these beetles are recent acquisitions to the Basin fauna. It is unnecessary to enter into details here, as I have gone over the matter with more minuteness in a paper now in press.

Taking as an example, one of the tiger beetles, *Cicindela echo* Casey, we find it distributed as follows,—on the mud beaches of Great Salt Lake, Utah Lake, Sevier Lake and Little Salt Lake, in Utah; at Humbolt Lake, in Nevada; and at Honey Lake in eastern California. All these points lie within the Great Basin, and the beetle is entirely unknown from any other localities, though it has a close relative, *Cicindela pseudosenilis*, at Owens' Lake, also within the Basin. All these lakes are now separated by miles of burning desert, forming a barrier that completely prohibits intercourse between the different colonies. The breeding of the species on these deserts is equally impossible, since a certain amount of moisture, the year round, is necessary for its growth.

How are we to explain such a distribution? Why do we find colonies, evidently arising from the same stock, though the members of one differ more or less from those of another, scattered in these widely separated localities, when it is perfectly evident that conditions are such that passage from one lake to another is out of the question? My reply is, we must look to the ancient history of the region—to its geological record—for our answer.

Even the earliest explorers of the Great Basin noticed that the terraces on the mountains near Great Salt Lake indicated the former existence of a much larger body of water on the same site. The geologists of the United States Geological Survey have completed a study of the evidence, and have mapped the boundaries of the great lakes that are now known to have occupied the valleys during the Pleistocene periods. Their maps show the existence of two principal water bodies, one to the eastward, which has received the name Lake Bonneville, and one to the westward, known as Lake Lahontan. Between them was a plateau, dotted with smaller lakes.

With the passage of the ages, there came about a great diminution of the rainfall, and a consequent shrinkage of the great lakes of the Basin. Then came a period of humidity and a second rise of the waters, followed by a time of drought even more complete. The lakes, as a result, lost greatly in volume, bays became detached from the main bodies, forming separate independent lakes, each in its own restricted basin. Some of these, in their turn, dried up altogether, others persisted, though often, perhaps, only as small

pools, fed by perennial springs—a condition exemplified to-day on the Sevier and Humboldt flats. These are practically extinct as lakes, since they contain water only in the winter or after heavy floods, and the shore beetles have been forced to gather about the few small springs that moisten the ground along the borders.

My proposed explanation, correlating the briefly outlined geological history with the facts offered as to the distribution of the insects, may be summarized as follows:—

1. The shore beetles under consideration are confined to the Great Basin or its immediate borders, and have, in general, no allies in other districts from which they could have been recently developed. This in itself is strong presumptive evidence that they are endemic, not immigrants.

2. Within the Basin, recent conditions are such that the present distribution cannot possibly be a matter of modern origin. The small lakes now remaining in the Basin are separated by great tracts of arid desert, impassable to beetles depending on a moist soil for their development and food supply. The nature of these insects is such that they cannot be carried long distances, as eggs or larvæ, on the feet of birds or other animals.

3. Ancient conditions, as shown by the geological history through the Pleistocene, were favorable to the diffusion of shore-loving insects through the Basin, because of the much greater extension of the lakes in those times.

4. The insect most thoroughly studied, *Cicindela echo*, is entirely confined, in its present range, to the neighborhood of lakes, which from their size and the presence of nearby springs, may be presumed to have lasted in some form from a remote period—even through times of severe drought. Other littoral forms follow the same general law, though some of them are less sensitive to local conditions.

From these facts, I think we can come to but one conclusion—the beetles under consideration are types that have inhabited the Basin during the Pleistocene times when the shores of the great lakes stretched over hundreds of miles of what are now desert sands. As the lakes shrunk during times of drought, the insects followed the retreating beaches. Those which attached themselves to bodies of sufficient size or permanence were able to sustain their specific existence, while such as were dwelling on the edges of pools of a transient nature were exterminated altogether. Thus we have the phenomenon of discontinuous distribution, presented not by one species alone but by an entire assemblage.

The Chairman, Dr. Fletcher, expressed in happy terms the thanks of the audience to Prof. Wickham, for his interesting address and his kindness in travelling so far to attend the annual meeting of the Society.

SECOND DAY'S SESSION.

The Entomological Society resumed its meetings at 10.30 o'clock, a.m., the President, Prof. Lochhead, occupying the chair. The first order of business was the election of officers for the year 1904-5, which resulted as shewn on page two.

Dr. Fletcher moved, seconded by Mr. G. E. Fisher, "that popular articles should be published in the *Canadian Entomologist* next year, at least two pages per month, or more at the discretion of the Editor." After some remarks by the mover and seconder and also by the Editor in support of the resolution, it was unanimously adopted.

Dr. Fletcher moved, seconded by Mr. J. D. Evans, "that a special vote of thanks be given to the Library and Rooms Committee for the work they have undertaken and so successfully carried out in moving the Society's library, collections and other property into their new room."—*Carried unanimously.*

On motion of Dr. Bethune, seconded by Dr. Fletcher, DR WILLIAM H. ASHMEAD, of the United States National Museum at Washington, author of many works on Hymenoptera, and a regular contributor to the *Canadian Entomologist*, was elected an Honorary Member of the Society.

During the last forty years the Society has only elected 21 Honorary Members, of whom eleven are still living.

The next order of business was the reading of papers, which occupied the rest of the morning and the session in the afternoon; among those read were two, which have since been published in the *Canadian Entomologist* as they were of a somewhat technical character, viz.: "The systematic position of the *Ægialitidæ*" by Prof. Wickham and "Further notes on types in the British Museum," by Mr. Lyman. Both these papers were illustrated with specimens of the insects referred to.

The following exhibits were shown by those attending the meeting: By Dr. James Fletcher: A box containing specimens of about twenty species of Canadian *Xylinas*, illustrating his remarks upon the genus; also *Dimorphypteryx pinguis* and the Negundo Twig-borer *Proteopteryx Willingana*, two new and interesting species; *Syngrapha ignea*, *Autographa flagellum*, a co-type of *Autographa rubidus*, and *Panchlora viridis* taken at Winnipeg the first record in Canada.

By Mr. T. N. Willing: Several boxes of Lepidoptera, Coleoptera, etc., collected in the Northwest Territories.

By Mr. Arthur Gibson: A collection of about twenty inflated larvæ, and a box of lepidoptera bred at Ottawa, among which were specimens of *Apanthesis superba*, *Papaipema purpurifascia*, etc. Also some American Beauty Roses from a conservatory in Toronto which were badly affected by a Thrips. It attacked the buds on the outside and thus spoiled the bloom. Fumigation with tobacco was found to control it satisfactorily.

By Mr. H. H. Lyman: A number of species of *Gortyna* (*Hydræcia*), both moths and inflated larvæ, among which was a new species not yet described. Also some *Lepidoptera* collected in Italy and other European countries.

By Mr. C. H. Young: A collection of Micro-Lepidoptera, containing about three hundred specimens of these exquisite moths, all most beautifully and perfectly mounted.

By Mr. J. D. Evans: A number of specimens collected at light in illustration of his paper.

By Mr. J. B. Williams: Specimens of Lepidoptera taken in the neighbourhood of Toronto.

By Prof. Wickham: Dissected specimens of *Ægialites* and allied genera, showing the structure of the under-side of the prothorax, in illustration of his paper.

By Mr. C. E. Grant: A box containing over seventy specimens of moths collected at Orillia.

By Mr. J. W. Cockle: A number of specimens of cocoons of *Telea polyphemus* shewing a great variety of spinning methods, in illustration of his paper.

In connection with the exhibits, Dr. Fletcher read an extract from a letter recently received from Dr. Ottolengui of New York, which referred to certain species of Canadian *Plusias*. It was as follows:

Autographa rubidus, Ottol.

"I have retained the male of *rubidus* and send you one of my three females. It is in quite as good condition, and, as it was before me when I described the species, I find it has a co-type label on it. This I leave, and trust that the specimen may find its way into one of your society or national museums.

The species is an interesting one to me as I think it accounts for the reported captures of *iota* to be found in Canadian literature. I have the true *iota* from Europe, from which it differs greatly, but it is not so dissimilar from the *iota* of some of the old published lithographic plates, and as the older writers used the European names for the American fauna rather more freely than we do now, I think *rubidus* is what they all called *Iota*. I have seen in all, only seven specimens of this, three of which I have. All came from eastern Canada except one determined for Mr. Wolley-Dod. This gives you the range, and it should be found anywhere in Canada.

You have two specimens of *flagellum*. This was long called *monodon*, until Prof. Smith discovered both types in the British Museum, and correctly announced in his Bulletin of the Noctuidæ, that both types referred to one species, thus giving *flagellum* antecedence. Nevertheless subsequently he renamed the species *insolita*, which of course falls. My specimens have been compared with all true types.

A word about *fratella*, a name which I notice in turning the pages of the Catalogue before me. I omitted this from my list, as a synonym of *ou*. Just before his death Mr. Grote sent a note to the *Canadian Entomologist* denying this synonymy. The same denial is to be found on the same authority in Smith's Catalogue; Morrison having declared *fratella* to be *ou*. By closely reading the paragraph referring to *ou* in the same work we find that though it is stated that the *ou* of the Grote collection agrees with Guenée's type in the British Museum, nevertheless we are told that *Californica* is a form of *ou* rather than of *gamma*. As a matter of fact, *Californica* is quite easily separated from *ou*, but is not so distinct from European *gamma*.

Sir George Hampson kindly made comparison of my material for me and selected a brilliantly marked large specimen as agreeing with the type of *ou*, and a very small dull colored specimen from Texas, he says "agrees with types of *ou* and *fratella*. Both identical." I should add that I sent all my material to Sir George Hampson without labels other than numbers, my labels being kept at home on pins similarly numbered. He was therefore not influenced by my views. As this comparison was made long after Mr. Grote had parted with his type, and as he gives no distinguishing characteristic in his description, by all rules *fratella* must pass into the synonymy.

Oxygramma is usually considered a southern species, but I already have it from London, Ontario, through Dr. Bethune."

At the close of the meeting votes of thanks were unanimously adopted to Principal Merchant for his kindness in allowing the Society to use the Lecture-room at the Normal School, and the lantern for their public meeting on Wednesday night; to Mr. S. B. McCreedy, for so satisfactorily manipulating the lantern and slides; and to Prof. Wickham and Mr. Willing, for coming such long distances to read papers and take part in the proceedings of the annual meeting.

INSECTS INJURIOUS TO ONTARIO CROPS IN 1904.

BY DR. JAMES FLETCHER, DOMINION ENTOMOLOGIST.

The season of 1904 was very similar to that of 1903 being irregular and on the whole unmarked by serious attack by insects upon our staple crops. The systematic entomologist has seldom seen such a poor collecting year, and with few exceptions outbreaks by injurious crop enemies were few. There were, as usual, local occurrences of cutworms, plum curculio, asparagus beetles, root maggots, etc., but most of the regular pests of the farm and garden were absent. No new insect enemies of importance were recorded during the past year. Loss from the ravages of the San Jose Scale was considerable in the small corner of the Province infested by that insect; but careful spraying was invariably followed by good results.

CEREAL CROPS.

Cereal crops throughout the province suffered little from insect enemies. There was very little injury by Hessian Fly, although Prof. Lochhead received complaints from Wentworth and Halton Counties. On the whole the wheat crop suffered much less than it has done in recent years from Hessian Fly and other Insects. Perhaps the worst injury to wheat was from rust. Oats were a fine crop, both yield and quality being above the average.

The Pea Weevil has been scarcer this year than for a great many years. Owing to the excessive ravages of this insect, many farmers during the past two or three years had almost given up growing this important crop, but the yield of 1904 and the general quality of the grain reaped will do much to restore confidence in peas as a paying crop, and a much larger acreage of this pulse may be looked for next year. It is surely of the greatest importance for all members of our Society to use every endeavor to persuade farmers to take the utmost care to sow no seed peas next spring, unless they are certain that they have been fumigated to destroy any chance weevils they might contain. As with every other frequently occurring injurious insect, the best work can be done by applying remedies even more assiduously than usual in those years when the enemy is present in the smallest numbers, and the present time seems opportune for us to continue vigorously our campaign against the Pea Weevil which was begun two years ago, and which has certainly had much to do with the present satisfactory diminution in injury by the Pea Weevil. It will be remembered that the remedies for the Pea Weevil are: 1. Sowing early so as to hurry on maturity as much as possible. 2. Reaping directly the crop is in a fit condition and threshing and fumigating with bisulphide of carbon at once, the seed to be then bagged up and kept in bags until required for use. As a general precaution no seed peas should ever be used while the Pea Weevil is abundant which are not known to have been treated, and buyers should always demand from their seedsmen such seed. There are several other methods of treating weevilly peas, besides fumigating, one of the most convenient being to sprinkle a little coal oil or turpentine over the seed and turning it well for two or three days before sowing. Another effective method is to hold over the seed in tight bags until the second year. The weevils always emerge the first spring after maturing and as they cannot perforate the sacks, they will die many months before the bags need be opened to use the grain.

FODDER PLANTS.

Grass and hay crops in eastern Ontario were of exceptionally good quality. Corn in most places was late, and in many places was caught by the frost. Clover seed was on the whole a poor crop. The severe winter of 1903, injured the roots considerably in the best seed-growing districts and the second growth from which the seed is reaped ripened slowly on account of dull, cool weather. The Clover Seed Midge was exceedingly active in nearly every part of the province. The well known remedy of feeding off seed-clover fields up to the 20th June so as to destroy the larvæ of the first brood before they mature, does not seem to be practised nearly as much as it ought to be by seed growers. This has been proved by constant experiment to be a very useful remedy and again indicates a means by which the members of the Entomological Society of Ontario may by giving timely advice in their various divisions, do much good for the province.

ROOTS AND VEGETABLES.

The attacks on these crops were all by well-known insects, and were severe in some instances. Undoubtedly the first place must be given, from the extent of injury, to the Root Maggots of cabbages, cauliflowers, radishes, turnips and onions, and 1904 was perhaps, signalized by wider-spread and more excessive injury by these troublesome insects than has ever been recorded. From the Atlantic coast right through to the Pacific, serious injury was wrought and from many places which had never previously been visited, reports of injury were received. All the usually recommended remedies were experimented with, but it must still be acknowledged that in some places and in years of very severe infestation no infallible remedy has yet been discovered. A remedy which sometimes, and in some places, answers satisfactorily and saves a crop, will in another year, or in a different locality, be useless. These differences cannot yet be explained and it is imperative that entomologists should give attention to this matter, so as to discover as soon as possible a practical remedy for these insects which every year do so much harm. It may not be amiss to repeat again the remedies which have given the best results. In early cauliflower or cabbage beds, surrounding the stems of the plants when first set out with discs of tarred paper, gave with us at Ottawa, excellent results, but at Nappan in Nova Scotia, they were found by Mr. W. S. Blair, the Horticulturist of the Experimental Farm for the Maritime Provinces, to be almost worthless. Where the bands have not been put on early, pouring around each plant a small quantity, not more than half a small tea-cupful, of a strong decoction of pyrethrum insect powder (4 ounces to the gallon of water), will frequently save the crop and among many experiments tried by Mr. Blair at Nappan, was the remedy which gave the best results. To apply the liquid the earth should be removed from the stems of the plants to the depth of an inch and a half, the liquid poured in and the earth replaced. In onion beds dusting white hellebore along the rows once a week as soon as the young plants appeared gave good results in years of a light infestation, but, when, as in 1904, onion maggots could be found throughout the season, this was comparatively useless and became impracticable on account of cost. Cook's carbolic wash, the manufacture of which was mentioned in our last report at page 65, proved a useful remedy and enabled radishes to come to perfect development without injury by the maggot. In our last report a method was mentioned of growing radishes, cauliflowers and some other vegetables un-

der light coverings made by stretching cheese-cloth over a cheap frame of wood. These experiments were continued during 1904, and gave very satisfactory returns. Small frames six feet by three feet and two feet six inches high, were very convenient for radishes and early cauliflowers.

Asparagus Beetles (*Crioceris asparagi*, L., and *C. 12-punctata*, L.) continue to do some damage in the Niagara and St. Catharines districts. The remedies most in vogue are dusting the plants at short intervals with freshly slaked lime at the time the slimy larvæ occur upon the plants. Poisoning with Paris green in either dry or wet mixtures is also useful.

The Cabbage or Turnip Aphis (*Aphis brassicæ*, L.) was the cause of appreciable loss in crops of Swedish turnips in central and eastern Ontario. Prompt spraying or hoeing out of the young plants when the colonies first appeared in August were attended with satisfactory results. It was noticed that high knolls in fields or areas near trees, where the turnips were somewhat starved, for lack of moisture, were invariably the first places of attack in turnip fields, therefore when looking for these insects it would be well for farmers to remember this and examine such places carefully when hoeing their turnips. When a colony is first noticed it should be destroyed by spraying with kerosene emulsion or a solution of whale-oil soap one pound in 6 gallons of warm water.

Cutworms. Several species of cutworms occurred in different parts of the province, and did a great deal of harm in field and garden crops. The most abundant of these was the Red-backed Cutworm (*Paragrotis ochrogaster*, Gn.), which was accompanied by the Dark-sided Cutworm (*Paragrotis mes-*

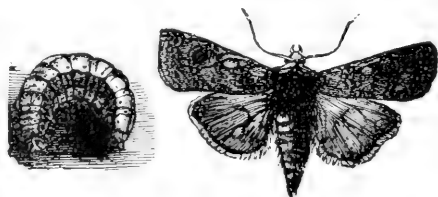


FIG. 9. Dark-sided Cutworm and moth.

soria, Harr.), Fig. 9. These caterpillars were enormously abundant on light land near Ottawa and attacked almost all kinds of crops. As in past years a prompt application of the poisoned bran mash stopped injury at once. Gardeners who had not previously tried this remedy were literally amazed at its prompt effectiveness. The habits of the Red-backed Cutworm are as follows. The eggs are laid in the autumn, and pass the winter as such, the young larvæ not hatching until the following spring. Whether this is always the case, I have as yet been unable to learn; but eggs laid late in August passed through hot weather in September and October and did not hatch until the following May, but at that time much larger larvæ were found out of doors in the ground.

The Climbing Cutworm (*Paragrotis scandens*, Riley), which here is extremely local attains almost half its growth before winter sets in, increases rapidly in spring and is frequently troublesome in gardens on sandy soil. In making the bran mash mentioned above it is best to dampen some of the bran slightly with water containing a little sugar. After mixing thoroughly, add the Paris green little by little stirring the mixture all the time. Half a pound of Paris green is sufficient to poison fifty pounds of bran. The mixture when ready for use, should be dry enough to crumble freely through the fingers and may then be distributed through an infested drop either by

placing a small quantity between the plants or along the edge of an infested crop by scattering it broadcast or running a drill of it close to a crop by means of a seed drill, or similar implement. There are other remedies which may be used for cutworms with good effect. A collar of paper or a ring of tin put around the stem at the time of planting will prevent the destruction of many plants, and a wise precaution is to destroy by burning the haulms and stems of all plants from which the crops have been reaped. This should be done as soon as the crop is picked so as to leave the land available for other crops and to remove many insects and fungi which might harm a future crop. The moths of many cutworms lay their eggs in autumn, and for this reason land should be kept scrupulously clean of all weeds and useless vegetation in autumn, as these would be an attraction to the female moths when seeking suitable places for laying their eggs, at the same time many weed seeds would be prevented from maturing.

The Beet-leaf Miner (*Pegomyia bicolor*, Wied.) appeared in several places, more particularly in Western Ontario. This caused some alarm lest it should injure the sugar-beet crop, which is now receiving much attention. These fears fortunately appeared to be unfounded, and in late summer all appearance of the attack had disappeared. The injury consists of large blotch mines which are formed in the tissues of the leaves by the maggots of a small fly. Occasionally these are so abundant that the greater part of the leaf is involved and the roots do not form properly. I know of no practical remedy, but fortunately the injury is seldom so severe as to affect the crop, the chief growth of which takes place in summer and autumn.



FIG. 10. Cabbage caterpillar, *a* ; chrysalis, *b*.

The Green Cabbage Caterpillar (*Pieris rapæ*, L.). Although present to some extent, this destructive enemy of the cabbage was noticeably less abundant than usual last season and was easily controlled. The best remedy is to dust the plants as soon as the eaten leaves show the presence of the caterpillars, with a mixture consisting of one pound of insect powder in four pounds of cheap flour. This powder falling on the caterpillars or diluted and washed down to them by dew or rain, kills every one of them it comes in contact with, in a few hours. The practice of using Paris green in any form on cabbages, is much to be condemned. Insect powder, known also as Dalmatian, Persian and Pyrethrum Insect powder, is a vegetable poison made by pulverizing the flowers and buds of certain species of plants allied to the *Chrysanthemum*, and, although so very fatal in its effects upon most insects, is almost harmless to the higher animals.

The Carrot Rust Fly (*Psila rosæ*, Fab.). The maggots of this insect bore into the carrots giving them a rusty appearance on the outside and producing brown discoloured channels which run in all directions through the roots. The attack was not so severe last season as has sometimes been the case of late years. The worst injuries were in the Maritime provinces, but there were also one or two occurrences reported in Ontario, as at Ottawa, Perth, and even as far west as Barrie, which as far as I know is the furthest point west, where the insect has occurred.

FRUITS.

Fruit crops were little injured by the well known and usual pests. The apple crop was large and where properly sprayed was of excellent quality. Plums were the chief failure and the injuries of the Plum Curculio upon the light crop were serious. This insect also turned its attention in many places to the apple crop, and gnarled and spotted fruit from this cause was sent in from many places. Regular spraying with poisoned Bordeaux mixture, reduced the injury to a considerable extent and orchards which were cultivated and kept free from undergrowth during the autumn seemed to be less attacked than where sod or even cover crops were on the land.

The San José Scale (*Aspidiotus perniciosus*, Comst.) still exists as a very injurious pest of the orchard in that small part of the Province where it exists, and where it has done much harm for the last six or seven years. There is now no doubt that the lime and sulphur wash as worked out by Mr. George E. Fisher, and other experimenters is a practical remedy for the San José Scale, and where persistent spraying is practised, clean paying crops can be grown, and the trees preserved in a healthy state for future crops. The necessity of persistent work, however, must be expected with this insect. The matter is now in the hands of the fruitgrowers themselves and it is well understood by all who will read and observe for themselves that even in infested districts, paying crops of apples, peaches, plums and pears, can be grown if the recommended measures are carried out. There are several methods of preparing the lime and sulphur wash, the more important of which have all been described from time to time in our annual reports. The chief difference in their preparation consists in the time it is deemed necessary to boil the washes. Mr. Geo. E. Fisher, who certainly has had as much experience in this matter as any living man, claims that there should be in every gallon of wash, half a pound of sulphur and one pound of lime, which must be boiled together for not less than two hours. The usual practice however among fruit growers, who used this wash to a large extent in 1904, in the Grimsby, St. Catharines and Niagara districts, I found was to boil the wash for about one hour only. Excellent results were obtained, which, however, might possibly have been improved by longer boiling. The new methods of combining the sulphur with the lime by means of the heat of the latter while slaking and the addition of either caustic soda or sal soda, up to the present seem to be giving very satisfactory results not only in our own experiments but in careful investigations which have been carried on by Prof. Felt in New York. Further study will be given to the matter and if an effective wash can be made in this way without the long boiling, it certainly will be a means of inducing many to do so, who at the present time do not use this useful remedy.

The range of usefulness of this wash as an insecticide and fungicide is wider than that of many other materials. Experiments in destroying the eggs of Apple Aphis and of the aphid which is so destructive to the appear-

ance of the High-bush Cranberry (or Guelder Rose, also called Snowball tree), distorting and curling up the leaves, were extremely satisfactory at Ottawa. The latter insect is so prevalent that it is a rare thing to see a tree which instead of being an ornament is not a disgusting mass of distorted leaves, swarming with plant lice. Bushes sprayed with the lime and sulphur wash, just before the buds burst, were perfectly clean, with only a few distorted leaves on the tips of some of the top twigs which evidently had been missed when the bushes were sprayed. The fungicidal value of this wash was also plainly manifest on apple trees, which were sprayed for the destruction of the eggs of the apple aphid.

The common Oyster Shell Scale, which all through Canada every year does so much harm is easily controlled by means of the lime and sulphur wash. This wash is for winter use only, as it is destructive to all kinds of foliage.

The New York Plum Scale (*Lecanium cerasifer*, Fitch). This soft scale was seen in several places in the Niagara district but does not seem to have done very much harm. Its habits are different from those of the two scales mentioned above. The San Jose Scale passes the winter as a half-grown scale attached to the bark, with its delicate threadlike beak sunk into the tissues of the wood, whence it can never withdraw them. The New York Plum scale, on the other hand, migrates in the autumn to the twigs where the young and very small scale insects cluster together and pass the winter. In the spring they again move and take up suitable places for growth upon the young and forming wood. Here they grow rapidly during May, and in the following month the females produce eggs beneath the scales from which about mid-summer the young bark-lice emerge and distribute themselves over the trees. The Oyster-shell and Scurfy scales on the other hand pass the winter as eggs beneath the protecting scales of the dead females. These different habits should be borne in mind when a remedy is being adopted. The San Jose Scale breeds continuously during the summer and up to frost, producing an incredible number of young. It is this enormous ratio of production, and the long period during which young are continuously brought forth, which renders this insect such a serious pest. The three other scales mentioned have only one brood of young in the year.

The New York Plum Scale is best treated by spraying the trees, upon which it occurs, early in spring before the buds burst, with a strong kerosene emulsion dilution, a whale-oil soap solution, or with the lime and sulphur wash. If trees are found to be infested after the leaves have opened, the kerosene emulsion or whale-oil soap solution may be used advantageously. When the scales are large and swollen, and this is the time they are generally noticed, they are capable of doing very little harm. It is better therefore to wait until the young insects leave the scales and are noticed crawling about on the trees. Spraying at that time will destroy large numbers without any fear of injuring the trees.

A noticeable feature of the past season has been the small amount of injury attributable to many of the well known destructive enemies of the orchard and garden. The Codling Moth, which is every year the cause of serious loss in the apple crop, did remarkably small injury and hardly occurred at all in those sections of the province east of Toronto where there appears to be only one brood. West of that point the first brood was little noticed, but the second brood in some places was the cause of some loss. The remedies for the Codling moth are a combination of spraying in spring and banding the trees with burlap in late summer. With regard to this latter method it must be pointed out that unless the burlap bands are taken off regularly and either

scalded or crushed between rollers, more harm than good may be done by these bands being placed on the trees. Another point also which will require attention is to see that the bark of the trees beneath the bands is scraped with a wire brush, or other hard instrument, to destroy the cocoons of such caterpillars as have partially bored into the bark to pupate. These are extremely difficult to see unless carefully looked for.

The Squash Bug (*Anasa tristis*, DeG.). Another troublesome enemy of the fruit grower and gardener which this year was less destructive than has for many years been the case, was the large so-called "stinkbug" or "Bishop bug" of western Ontario.

Tent Caterpillars which some years ago stripped many orchards and tracts of forest land were only noticed in a few districts in south-western Ontario, and they were so thoroughly destroyed by parasites two years ago that not a moth or caterpillar of either of the common species was seen at Ottawa during the past year. There is no doubt that they will soon reappear again; but, with ordinary care, no well kept orchard will ever suffer seriously from these insects. Regular annual spraying will prevent injury by Tent Caterpillars, Cankerworms, Eye-spotted Bud moth, leaf rollers, and all the ordinary foliage-eating pests of the orchard. If spraying is supplemented with the washing of the trunks in the beginning of June and July, with alkaline washes, most of the different kinds of borers which attack apple trees, will be kept at bay. For the Peach Borer, special steps will have to be taken and for the small Shot-borers and Bark Beetles, carbolic washes must be applied early in spring. If besides these precautions proper attention is given to the fertilization of the soil and the pruning of the trees so as to allow a free action of sun and wind, there will be little harm from injurious insects and fungous diseases. There is nothing so manifest to the practical entomologist as the fact that vigorous, well-cared for trees, are far less attractive to their insect enemies than those trees which are stunted or in some other way injured.

HOUSE PLANTS.

The insects which do injury in window gardens and upon house plants generally, are few in number and may be treated in a wholesale manner. For the satisfactory cultivation of house plants one of the prime principles is to grow only such number of plants in a window as can be properly attended to, and as can obtain a suitable amount of light, air and space for their symmetrical development. The number of insects which attack house plants is small and the same treatment answers for most of them. There is a great deal of trouble saved by choosing such plants as are seldom infested by insects. To this class belong the different kinds of Geraniums, on the whole, perhaps, the most valuable and satisfactory plants for house culture. They are easily propagated, very resistant of neglect and most profuse bloomers. Fuchsias, begonias and bulbs of various kinds are seldom attacked by insect pests. On the other hand, palms, cacti, foliage plants and ferns are liable to be much infested by different kinds of scale insects, *Thripidae* and the so-called Red Spiders; roses, by scale insects and plant lice. The first principle of window gardening is to give the plants suitable soil, pots large enough but not too large, and good drainage with regular watering. The insects as stated above may be easily controlled on general principles. The first of these is to wash the foliage regularly to free it from dust and scale insects; spraying plants of almost all kinds is very beneficial to them. Palms and thick-leaved plants like the oleander, may be washed with a piece of soft flannel.

nel or a sponge, drawing the leaves one by one through a fold of the flannel. For this purpose any soap will answer, but tar soap is the best. There is also a special tobacco soap which is made for this purpose. When a plant is received and is found to be thoroughly infested by scale insects it is well to make a small quantity of kerosene emulsion and this may be done easily in an ordinary quart bottle, placing the ingredients in it and shaking it violently by hand. After treating a plant, either with strong soap suds or kerosene emulsion, it is well to let it stand for a short time, from half an hour to an hour, and then wash off the soap. When spraying or washing large plants they may be stood in a bath or other large receptacle. When roses or other plants are infested by plant lice, many of these may be dislodged by simply puffing pyrethrum insect powder on to the colonies. This will cause many of them to drop, but will not kill them and unless they are swept up and destroyed they will crawl back again on to the plants. For thoroughly cleaning the plants both of the insects and of the honeydew produced by them, a washing with soap suds or kerosene emulsion will be necessary. When a prickly cactus is found to be infested with woolly aphis or other scale insects, perhaps, the easiest treatment is to touch the separate insects with a small paint brush dipped in alcohol. "Red Spiders," which are among the most troublesome pests of the window gardener, are reduced in numbers by keeping the plants as cool and damp as possible, but more than this is necessary, and the sovereign remedy for these and all kinds of mites, is to dust them frequently with flowers of sulphur. This material in no way injures the plants but renders them very distasteful to the spinning mites which as a class are known by the name of Red Spiders.

ENTOMOLOGICAL RECORD, 1904.

BY JAMES FLETCHER, DOMINION ENTOMOLOGIST, OTTAWA.

The season of 1903 was cool and disappointing, but that of 1904 was even more so. Collectors from every part of the Dominion make complaints of the small number of days which could be called good collecting days. In my own experience of thirty years in Canada I have never known a season when insects were so scarce, and this character extended from the Atlantic to the Pacific. I have been pleased to note the stimulating effect of the publication of the Entomological Record among all classes of collectors; but as compiler I must still urge collectors to read this Record carefully and make the fullest use of the many opportunities for advancing their studies thereby afforded. In preparing the lists herewith submitted, I have received much assistance from collectors who have sent in much more regularly than heretofore, records of their captures. Special lists have also helped very much by giving critical notes when identifying specimens. Valuable reports of a more extended nature, given herewith, have been received from Mr. W. D. Kearfott on Micro-lepidoptera, from the Rev. G. W. Taylor, on Geometridæ, and from Mr. E. D. Harris, on Cincindelidæ. These reports are of special value, and the writers have most generously offered their services to any of our collectors who will correspond with them.

Other specialists, who, as in the past, have done good service for Canadian entomology, have this year again put us under deep obligations for expert assistance. Dr. Howard, the Chief of the Bureau of Entomology, at Washington, as well as Messrs. Dyar, Coquillett and Ashmead, of Washing-

ton; Dr. J. B. Smith, of New Brunswick, N.J.; Mr. W. Beutenmueller, of New York; Dr. Henry Skinner, of Philadelphia; Mr. E. P. Vanduzee, of Buffalo; Prof. H. F. Wickham, of Iowa City, Iowa; Prof. J. S. Hine, of Columbus, Ohio, and Mr. W. H. Harrington, of Ottawa, Ont.; have examined and named numerous collections during the past year, and, although the thanks of the individual collectors have been expressed to them, I take pleasure in publicly acknowledging here their help to the general cause of Canadian entomology.

Collections of insects have been made in various parts of Canada this year by visitors, perhaps the most important of these being by Mrs. Nicholl, of Merthyr Mawr, Bridgend, South Wales, who spent the summer in the Rocky Mountains and made extensive collections. Possibly the most interesting result of Mrs. Nicholl's work was the discovery of *Erebia Vidleri* in considerable numbers in the Okanagan valley. The original locality where the types were collected by Mr. Vidler, thirty years ago is somewhat in doubt. Nothing had been seen or heard of the species after it was first taken, until in 1898, when I rediscovered it on Mount Chéam near the mouth of the Fraser River in British Columbia. Mrs. Nicholl also took during the summer several specimens of that Rocky Mountain 'Greyhound', *Brenthis astarte*, and many other rarities seldom seen in Canadian collections.

Mr. C. W. Leng, of New York, tells me that Mr. W. S. Genung spent three months this year, collecting beetles in Nova Scotia, Cape Breton and Newfoundland, and sent him 11,000 specimens containing some great rarities.

A few small collections were brought back by the officers of the Geological Survey of Canada, but a great deal more good work might be done by these gentlemen, with their exceptional opportunities, in adding to the large collection of insects already in the museum of that Department. Specimens from any little visited locality are of great scientific value if the date of collection and exact locality are noted—even a single specimen may be of the greatest interest. A few specimens well preserved are of far more value than a large number in poor condition or without data. Mr. Jos. Keele secured some specimens of special interest in the valley of the Mayo River, Yukon Territory. Mr. E. R. Faribault collected in Nova Scotia, and Mr. Andrew Halkett, who was the naturalist on the "Neptune" in her explorations under Mr. A. P. Low, in Hudson Bay in 1903-04, brought back some very interesting specimens.

LITERATURE.

Among the works which have dealt with Canadian insects and which have appeared during the past year, mention may be made of the following:

Dyar, Harrison G. Lepidoptera of the Kootenai District of British Columbia, Proc. U. S. Nat. Museum, vol. XXVII., pp. 779-938. — One of the most important publications of 1904 for Canadian entomologists is Dr. Dyar's annotated list of the lepidoptera taken by him and Messrs. Currie and Caudell during a three months' visit to Kaslo on Kootenai Lake in the summer of 1903. This list also includes mention of the species found in the rich local collection of Mr. J. W. Cockle. The great value of this list will be found in the critical and comparative notes on the species mentioned, with their near allies. 653 species are mentioned, with more or less complete larval notes of 167. There have been many collectors in the Rocky

Mountains of Alberta and British Columbia, and this report will be invaluable in working up their captures, enriched as it is by Dr. Dyar's experience and great knowledge of the forms occurring in the adjacent western States of the Union. Naturally many species were added to the list of Canadian Insects, and many indefinite western forms after careful study were given varietal or specific rank and described. By the publication of Dr. Dyar's list several doubtful cases of identification are cleared up and future students of western mountain lepidoptera will have a firm basis for their studies.

Smith, J. B. Common Mosquitoes of New Jersey, Bull. 171, N. J. Agric. Ex. Stn.—A pamphlet of 40 pages well illustrated and the matter chiefly original, conveniently arranged in Dr. Smith's usual thorough and practical manner. It will be found very useful to those taking up the study for the first time, and also by the advanced student on account of the new matter relating to life histories.

Felt, E. P. Mosquitoes or Culicidae of New York State, N.Y. State Museum Bull. 79, pp. 165, 57 plates, 113 wood cuts.—This is a sumptuous bulletin beautifully printed and profusely illustrated. The literature dealing with mosquitoes is now very extensive, and this paper will be found one of the most valuable of those dealing with this now popular study. The subject is very fully dealt with, and many species are treated at length. A valuable bibliography mentions all the important publications from 1847 down to the present time, 130 in number. As an appendix of six pages is a generic revision of the Culicidæ. The whole is completely and carefully indexed, a most satisfactory character of all the publications by Dr. Felt and his predecessor, Dr. Lintner.

Swezey, Otto H. A Preliminary Catalogue of the Described Species of the Family Fulgoridæ of North America, north of Mexico. Ohio Dept. Agric.; Div. Nursery and Orchard Inspection, Bull. No. 3.—This catalogue of 48 pages contains much valuable information concerning these little known homopterous insects. Not only is an attempt made to include all of the described species from North America, north of Mexico, but with each genus and species are given a full synonymy and bibliography, as well as notes regarding localities, food plants, and life histories, as far as known. The want of such a source of reference was much felt.

The Harriman Alaska Expedition, vols. VIII. and IX., Insects.—These volumes published in co-operation with the Washington Academy of Sciences are an important contribution to American entomology. The material was collected by Prof. Kincaid, of the University of the State of Washington. More than 8,000 insects were collected representing 1,001 species, 344 of which were new to science. The identifications have been made by experts through Dr. Howard at Washington. Unfortunately, the price at which these volumes are published will preclude their wide distribution amongst the students of the different orders. The style of printing, binding and illustration are of the very highest class.

Busck, August. Tineid Moths from British Columbia, with descriptions of new species. Proc. U. S. N. M., vol. XXVII., pp. 745-778.—This paper is based mainly on a large collection made in British Columbia, chiefly at Kaslo, on Kootenai Lake, in 1903, by Dr. H. G. Dyar assisted by Messrs. A. N. Caudell and R. P. Currie. There are also notes on collections received by the National Museum from the States of Washington, Oregon and Idaho. Notes of more or less length are given of 55 British Columbian species, and among these 17 are described as new.

Currie, Rolla P. An Insect Collecting Trip to British Columbia, Proc. Ent. Soc. Wash., vol. VI., p. 24.—This paper, although it does not attempt to cover all the insects noticed or studied during the visit of Messrs. Dyar, Caudell and Currie to Kaslo, B.C., gives much valuable information regarding the region, the plants and insects which were noted in the different localities in the Kootenai District visited by the above named gentlemen. It will be of special interest to anyone contemplating a visit to that interesting part of British Columbia.

Dyar, Harrison G. Notes on the Mosquitoes of British Columbia, Proc. Ent. Soc. Wash., vol. VI., p. 37.—Twenty different species of mosquitoes are noted in this article, represented by 1,238 specimens collected in 1903. Biologic notes are given of many of the species.

Beutenmueller, Wm. American Museum Journal, vol. IV., No. 4. (Reprint.) The Insect-Galls of the Vicinity of New York City.—This is a most useful pamphlet of 38 pages, and will be found of great value in the identification of many of the insect-galls about which so little is known. 87 different species of gall insects are listed and an illustration of the gall in each instance given.

SPECIALISTS.

The records received this year are again chiefly made up from the work of lepidopterists and coleopterists. Collections have been made in other orders; but the number of certain identifications is smaller than was hoped might be the case, and the recording of these, except in a few instances, does not seem to be advisable just now. On the whole decidedly more interest was shown in the study of various orders during 1904 than for many years past. Mr. R. V. Harvey, of Vancouver, has done much in encouraging the British Columbian collectors and holding them together. He has also published a list of the Butterflies of his province, which will form a basis for future work. The Rev. G. W. Taylor, has pushed forward his studies of the geometridæ and is now in correspondence with nearly all the collectors in the Dominion. It is to be hoped that before long Mr. Taylor will see his way to publish the results of his labours. Mr. J. W. Cockle at Kaslo, and Messrs. F. H. Wolley-Dod and A. F. Hudson at Millarville, Alta., have made great advance in their studies of the noctuidæ. Mr. T. N. Willing at Regina, and the Criddle brothers at Aweme, Man., have added largely to their general collections of insects. Mr. E. F. Heath, at Cartwright, in Southern Manitoba, has collected vigorously and added much to the local fauna of his province. In Montreal Messrs. H. H. Lyman, A. F. Winn and C. Stevenson have been actively at work on the life histories of lepidoptera. At Ottawa Mr. C. H. Young has made extensive collections in some of the families of the lepidoptera and has sent them to specialists, all of whom comment upon the great excellence of his mountings. In the Division of Entomology at the Central Experimental Farm the entomologists have devoted much time to working out life histories, and besides have endeavored to help and encourage students in all orders.

ACTIVE WORKERS.

The following list gives the names of the most active workers in Canada which have been heard from during the past year. There are doubt-

less many others, but I have not heard from them during 1904. The initials in parentheses after their names indicate the orders they are studying, or if they have general collections.

- Anderson, E. M., Victoria, B. C. (L.)
 Bethune, Rev. C. J. S., London, Ont. (Gen., L., C.)
 Bégin, Rev. P. A., Snerbrooke, Q. (Gen.)
 Baird, Thomas, High River, Alta. (Gen.)
 Brainerd, Dwight, Montreal. (L.)
 Bryant, Theodore, Wellington, B. C. (L.)
 Burman, Rev. W. A., Winnipeg. (Gen.)
 Bush, A., Vancouver, B. C. (L.)
 Campbell, D. A., Ottawa. (Gen.)
 Chagnon, Gus., Montreal. (C.)
 Ceeke, J. W., Kaslo, B. C. (L.)
 Criddle, Evelyn, Aweme, Man. (L., Gen.)
 Criddle, N., Aweme, Man. (L., Or., C.)
 Criddle, Stewart, Aweme, Man. (L., Gen.)
 Crew, R. J., Toronto. (C.)
 Dennis, A. J., Beulah, Man. (L.)
 Denny, Edw., Montreal. (L.)
 Desrochers, Rev. J. E., Rigaud, Q. (L., C.)
 Dod, F. H., Wolley, Millarville, Alta. (L.)
 Draper, R., Vancouver. (L.)
 Evans, J. D., Trenton, Ont. (Gen., L., C., Hym.)
 Findley, Rev. G. H., Ainsworth, B. C. (L.)
 Fletcher, Dr. J., Ottawa. (Gen., L., C.)
 Fyles, Rev. Thos. W., Levis, Que. (Gen., L., Hym.)
 Garrett, C., Calgary, Alta. (L.)
 Gibbon, H., Beulah, Man. (L.)
 Gibson, Arthur, Ottawa. (L., Gen.)
 Grant, C. E., Orillia, Ont. (L.)
 Gregson, P. B., Blackfalds, Alta. (Gen.)
 Guignard, J. A., Ottawa. (Gen., Hym.)
 Hanham, A. W., Victoria, B. C. (L., D., C.)
 Harrington, W. H., Ottawa. (C., Hym., Hem., D.)
 Harvey, R. V., Vancouver. (L., Odon.)
 Heath, E. F., Cartwright, Man. (L.)
 Huard, Rev. Victor, Quebec. (Gen.)
 Hudson, A. F., Calgary, Alta. (L.)
 Jones, W. A. Dashwood, New Westminster, B. C. (L.)
 Keen, Rev. J. H., Metlakatla, B. C. (C.)
 Lochhead, Prof. W., Guelph, Ont. (Gen., Or.)
 Lyman, H. H., Montreal. (L.)
 McIntosh, W., St. John, N. B. (L., D., C.)
 McIntyre, A. D., Boisdale, Nfld. (C.)
 MacLaughlin, T. J., Ottawa. (Odon.)
 Marmont, L. E., Rounthwaite, Man. (L.)
 Metcalfe, W., Ottawa. (L., C., Hem.)
 Moore, G. A., Montreal. (Hem.)
 Morden, John E., London, Ont. (L.)
 Perrin, Jos., Halifax, N. S. (L.)
 Norris, A. E., Montreal. (L.)
 Quellet, Rev. C. J., Montreal. (C., Hym.)
 Richard, A. E., Ottawa. (L.)
 Roy, Rev. Elias, Levis, Q. (C.)
 Sanderecock, W. C., Lauder, Man. (L.)
 Saunders, H. S., Toronto. (L.)
 Simpson, Willibert, Ottawa. (C.)
 Suffield, J. D., Morden, Man. (L.)
 Sanson, N. B., Banff, Alta. (Gen., L.)
 Schmitt, Dr. J., Anticosti. (Gen.)
 Southee, G. R., Outremont. (L.)
 Stevenson, Charles, Montreal. (L., C., Hem.)
 Tanton, J., London, Ont. (L.)
 Taylor, Rev. G. W., Wellington, B. C. (L., Hem., C.)
 Tipping, Dalton, Blackfalds, Alta. (Hym., Gen.)
 Thompson, W. Robin, London, Ont. (L., C.)
 Venables, E. P., Vernon, B. C. (L., C., Hym.)
 Walker, Dr. E. M., Toronto. (Or., Odon.)
 Winn, A. F., Montreal. (L.)
 Wilson, E., Vancouver. (L.)
 Wilson, Jno., Vancouver. (L.)
 Wilson, T., Vancouver. (L.)
 Wilson, W. J., Ottawa. (Gen.)
 Williams, J. B., Toronto. (L.)
 Willing, T. N., Regina. (L., Or., C.)
 Wood, A. A., Coldstream, Ont. (L.)
 Young, C. H., Hurdman's Bridge, Ont. (L.)

NOTES OF CAPTURES.

LEPIDOPTERA.

(Arranged according to Dyar's List of North American Lepidoptera, U. S. N. M. Bull. No. 52.)

RHOPALOCERA.

(Dyar's number.)

8. *Papilio daunus*, Bdv. Regina, N.W.T., (Mrs. J. R. C. Honeyman).
16. *Papilio machaon*, L., a. *alaska*, Scud. Quite common along the shores of Mayo Lake, and valley of Mayo River, Yukon Territory, during July and August. (J. Keele).
28. *Neophasia menapia*, Felder. 1904 was a "menapia year"—millions these butterflies could be seen around the Douglas firs and on the sea between Vancouver Island and the mainland in August last.
- Pontia brassicae*, L. Two larvæ of this well-known European species, the "Large White," taken on Nasturtium vines in Westmount, Que., Sept. 4. Both parasitised. (Winn). The larval skin was exhibited at the annual meeting, Ent. Soc. Ont., 1904, and was undoubtedly rightly named by Mr. Winn.
62. *Eurymus meadii*, Edw., a. *elis*, Strk. Just coming out near Laggan, July 20, (Mrs. Nicholl).
64. *Eurymus boothii*, Curtis. Mayo Valley, Yukon, (J. Keele). A female. Elwes's fig. 5. Trans. Ent. Soc. London, part III. 1903, corresponds exactly with this specimen.
73. *Eurymus pelidne*, Bdl. a. *Skinneri*, Barnes. Just coming out, near Laggan, B.C., July 19, (Dod).
75. *Eurymus nastes*, Bdv. Not rare above timber line on several mountains near Laggan and Field, B.C., July 20 and onwards, (Mrs. Nicholl and Mr. Dod).
85. *Eureme euterpe*, Men., (lisa, Bdv.). Halifax, Aug. 24, (Perrin).
143. *Brenthis Alberta*, Edw. On several mountains near Laggan, near the summits. Less of a peak-lover than *astarte*, much more local and less common, but not nearly so difficult to capture. Both sexes were taken in about equal numbers. Mrs. Nicholl who subsequently collected on many mountains between Laggan and Field reported *alberta* to be "common everywhere." July 19 and onwards, (Dod.)
144. *Brenthis astarte*, D. & H. Fairly common on several bare peaks near Laggan, July 19 and 20. The males play around the extreme summits at 8,000 ft. or over. They are very hard to net, as their flight is exceptionally swift. The females were met with, but very rarely, much lower down, almost or quite at timber line (about 7,000 ft.). Mrs. Nicholl met with it almost everywhere she went in the Rockies. (Dod.)
207. *Polygonia satyrus*, Edw., High Falls, Que. July 12, (Saunders).
284. *Cænonympha typhon*, Rott., a. *laidon*, Bork. (*inornata*, Edw.). One damaged specimen taken at Lac Charlebois, Que., (Laurentian Mts.), July 21. Several seen from train window in same district June 4, (Winn).
286. *Enodia portlandia*, Fab. Scotch Lake, N.B., July 9, (W. H. Moore). This is a new record for New Brunswick.

295. *Eneis norna*, Thun., l. *Beanii*, Elwes. Very common on several bare peaks near Laggan, over 8,000 ft. July 19 and 20. Mrs. Nicholl found it common everywhere (on peaks) round Laggan, Field and Banff. (Dod.)
308. *Anosia plexippus*, L. One specimen in fresh condition, Vernon, B. C., Aug. 13. A rare visitor here, (Venables).
Thēcla Johnsoni, Skinner. Ent. News, XV., 298. North Vancouver, May 22, (Bush).
384. *Strymon titus*, Fab. Three specimens at Vernon, B. C., Aug. 15 and 16, (Harvey & Draper).
401. *Chalceria Snowi*, Edw. Fairly common on several mountains near Laggan, July 18-20, above timber, also on Mt. Assiniboine, 30 miles south of Banff, (Dod).
430. *Rusticus Shasta*, Edw., Red Deer River, 50 miles N.E. of Gleichen, July 5-9, very local, (Dod).
463. *Amblyscirtes samoset*, Scud. MacNab's Island, Halifax, (Perrin). Rather abundant along a railroad track, Chelsea, Que., May 28, (Gibson & Campbell).
464. *Pamphila palæmon*, Pallas, (*mandan*, Edw.). MacNab's Island, Halifax, (Perrin).
564. *Phycanassa viator*, Edw. Coldstream, Ont., July 31, (A. A. Wood).
624. *Thanaos martialis*, Scud. Coldstream, Ont., July 31, (Wood).
625. *Thanaos juvenalis*, Fab. MacNab's Island, Halifax, (Perrin).

HETEROCERA.

657. *Lepisesia flavofasciata*, Wlk., a. *ulalume*, Strk. Vancouver. Several in May, 2 sp. May 14, (Harvey & Bush). Larva feeds on *Epilobium*, (Cockle). Wellington 14 specimens, (Taylor).
659. *Lepisesia Clarkiæ*, Bdv. Vernon, May, (Venables).
664. *Aellopos tantalus*, L. Sydney Mines, C.B., (Miss Margaret Brown). One of the most remarkable captures of the year. Dr. Bethune also took a specimen of this southern hawk moth, about ten years ago, at Port Hope, Ont. See also Can. Ent., XXIII., p. 41, for note on a specimen taken at Grimsby, Ont.
681. *Ampelophaga chærilus*, Cram. MacNab's Island, Halifax, (Perrin).
713. *Sphinx Canadensis*, Bdv. When looking over the collection of Mr. H. S. Saunders, I noticed a specimen of this rare moth, which was taken by him in Ottawa, July 7, 1899, (Gibson). Ottawa, Aug. 12, a remarkably late date, (Fletcher).
765. *Pseudohazis Shastaensis*, Behrens. Kaslo, several taken in June, (Cockle).
934. *Æmilia roseata*, Wlk. Vancouver, July 10, (J. Wilson).
981. *Apatela cretata*, Sm. Millarville, female at sugar, June 20. Always a great rarity, (Dod). Wellington, (Taylor). First record in British Columbia.
996. *Apatela Manitoba*, Sm. Cartwright, 2 at sugar, June 20, (Heath).
- 1,017. *Apatela parallela*, Grt. Aweme, June 18, (Criddle).
- 1,032. *Apatela distans*, Grt., a. *dolorosa*, Dyar. Kaslo, several at sugar (Cockle).
- 1,034. *Apatela perditæ*, Grt. Kaslo, several at sugar, (Cockle).
Platyperigea anotha, Dyar. Kaslo, Aug. 12, (Cockle).

- 1,102. *Caradrina multifera*, Wlk. Wellington, new to B. C. list, (Bryant).
- 1,156. *Hadena adnixa*, Grt. Cartwright, at sugar, only one taken.
- 1,170. *Hadena tonsa*, Grt. Cartwright, one at sugar, July 25, not taken here before, (Heath).
- 1,186. *Hadena lona*, Strk. Cartwright, at sugar, always scarce, June 27, (Heath). A specimen received from Rev. J. H. Keen taken at the mouth of the Skeena River, B.C., July 10, and submitted to Dr. Smith, was named *runata*, Sm., which name is now a synonym of *lona*.
- 1,189. *Hadena Barnesii*, Sm. Aweme, July 23, (Criddle).
- 1,192. *Hadena mustelina*, Sm. Wellington, new to B. C. list, (Bryant).
- 1,216. *Hadena contradicta*, Sm. Millarville, June 27—July 9, a few at sugar. Not seen for years. (Dod.)
- 1,286. *Momophana Comstocki*, Grt. Vancouver, 3 specimens at light, April 30—May 3, (Harvey).
- 1,281. *Hyppa brunneicrista*, Sm. Millarville, June 24, at sugar. Rare, not seen for years. (Dod.)
- 1,290. *Dipterygia scabriuscula*, L. Cartwright, July 1, One at sugar, a record for Manitoba. (Heath.)
- 1,317. *Homohadena stabilis*, Sm. Regina, Aug 1, (Willing).
- 1,354. *Oncocnemis viriditincta*, Sm. Cartwright, one at sugar, not taken before. Recorded from Winnipeg by Hanham. (Heath.)
- 1,370. *Adita chionanthi*, S. & A. Cartwright, Aug. 12, several at sugar. I think I have only once before taken it. (Heath.)
- 1,389. *Rhynchagrotis gilvipennis*, Grt. Lac Charlebois (Laurentian Mts.), July 23, (Winn).
- 1,396. *Rhynchagrotis variata*, Grt. Oak Bay, Victoria. Early in Sept. at sugar. Rather a rarity here. (Hanham.)
- 1,419. *Platagrotis condita*, Gn. Cartwright. Two at sugar. *Condita* is always much rarer here than *pressa*, Grt. (Heath.)
- Eueretagrotis inattenta*, Sm. Millarville, July 2, not common, at sugar, (Dod).
- 1,450. *Setagrotis infimatis*, Grt. Oak Bay, Victoria, Aug. 23 to Sept. 17, at sugar, (Hanham).
- 1,477. *Noctua esuralis*, Grt. Meech Lake, Que., July 24, (Young).
- 1,492. *Noctua juncta*, Grt. Meech Lake, Que., July 4, (Young). The first specimen of this interesting species taken in the Ottawa District.
- Noctua dislocata*, Sm. Can. Ent., June, 1904. Millarville. A few males at sugar with *N. Calgary*, Sm. June 28—July 4. (Dod.)
- 1,522. *Chorizagrotis terrealis*, Sm. Millarville. One specimen June 30. A great rarity. (Hudson.)
- 1,548. *Feltia aneipennis*, Grt. At sugar. Kaslo, (Cockle).
- 1,610. *Paragrotis citricolor*, Grt. Cartwright, Sept. 16, at sugar. A great rarity; only one taken before this. (Heath.)
- 1,611. *Paragrotis acornis*, Sm. Cartwright. Two at sugar Aug. 19, rare, (Heath). During latter part of Sept. (Heath.)
- 1,682. *Paragrotis fuscigera*, Grt. Cartwright. A few at sugar during the latter part of Sept. (Heath.)
- 1,687. *Paragrotis ternarius*, Sm. Wellington, (Bryant). Addition to B. C. list.

- 1,693. *Paragrotis mollis*, Wlk. Millarville, Sept. 3, at light by Mr. Hudson. Only two specimens previously taken. (Dod.)
- 1,716. *Paragrotis basalis*, Grt. Cartwright, one at sugar, Aug. 2. The first time I have seen it here. (Heath.) Regina, (Willing).
- 1,720. *Paragrotis Idahoensis*, Grt. Wellington, (Bryant).
- 1,727. *Paragrotis abar*, Strk. Cartwright, one at sugar, Sept. 3. I took one last year which was named by Dr. Smith, and this agrees with it. (Heath.)
- 1,767. *Agrotiphila maculata*, Sm. Mts. Fairview and St. Piran, Laggan, B. C., above timber (7,500—8,500 ft.), July 19 and 20—rare, (Mrs. Nicholl and Mr. Dod).
- 1,806. *Mamestra rubefacta*, Morr. Millarville. June 17 at sugar, very rare, (Hudson).
- 1,840. *Mamestra sutrina*, Grt. Millarville, May 30, at light. Always a great rarity. (Hudson.)
- 1,877. *Mamestra circumvadis*, Sm. Millarville, June 30 and July 2, at light, always a great rarity, (Dod.)
Mamestra acutetermina, Sm. Cartwright. At sugar with *M. Goodellii*, Grt., June 20, (Heath).
Mamestra Dodi, Sm. Can. Ent., June, 1904. Millarville, June 25. As usual, not rare at sugar, (Dod).
- 1,895. *Xylomiges rubrica*, Harvey. Kaslo, a splendid specimen of this very variable species, (Cockle). Vancouver, several in April, (Bush).
- 1,907. *Scotogramma densa*, Sm. Kaslo, one specimen, (Cockle).
- 1,953. *Heliothis unipuncta*, Haworth. Oak Bay, Van. Island, one at sugar, Sept. 10. The only specimen I have seen in British Columbia. (Hanham.)
- 1,983. *Heliophila calgariana*, Sm. Millarville, Aug. 2, at sugar. Probably a variety of *anteroclara*, Sm. (Dod.)
- 2,006. *Himella contrahens*, Wlk. Lac Charlebois, Laurentian Mts. several at sugar, July, (Winn).
- 2,026. *Graphiphora peredia*, Grt. Cartwright, July 14, at sugar. This moth is of very uncertain occurrence. (Heath.)
- 2,067. *Cleoceris populi*, Strk. Millarville, Alta. Bred July 28—Aug. 4, from larvæ common locally on black poplar. Began pupating about June 25. (Dod.)
- 2,071. *Cleoceris curvifascia*, Sm. Cartwright, at sugar, Aug. 26. Rare, (Heath).
- 2,072. *Aporophila yosemitæ*, Grt. Mr. Heath has shown me that the insect which I have recorded from Rounthwaite and Aweme as *Hadena relecina* is really *A. yosemitæ*. It has been taken from Manitoba to the Rocky Mountains.
- 2,076. *Pleroma apposita*, Sm. Victoria, on fences and at light, during March. In 1903 this species was out at the end of February. A pair taken at light early in April are very black and may prove to be another species. (Hanham.)
- 2,084. *Xylina torrida*, Sm. Wellington, April 4, (Bryant).
- 2,107. *Xylina tepida*, Grt. Cartwright. At sugar, seems to be more abundant than usual this year. Sept. 16. (Heath.)
Xylina ancilla, Sm. Nepigon, bred from larva on *Cornus stolonifera*, (Fletcher). Cartwright, (Heath).

- Xylina Fletcheri*, Sm. Ottawa. Among material recently sent to Dr. Smith was a specimen of a new species which was taken at Ottawa, Oct. 7, 1903, and given this name. Mr. Gibson also took a specimen on Oct. 3 of this year.
- 2,116. *Litholomia Dunbari*, Harvey. Wellington, B.C., (Taylor).
- 2,168. *Gortyna medialis*, Sm. Millarville, Alta., Sept. 6 at light, (Dod).
- 2,178. *Papaipema purpurifascia*, G. & R. Larvæ common at Ottawa working in the roots of *Aquilegia*, moths emerging from Aug. 18 to Sept. 13. (Gibson.)
- 2,180. *Papaipema nelita*, Strk. Aweme, Aug. 30, (Criddle).
- 2,192. *Papaipema marginidens*, Gn. Trenton, (Evans).
- 2,224. *Orthosia inops*, Grt. Cartwright, at sugar, Aug. 8. This is the second time that this little moth has been taken by me. (Heath.)
- 2,230. *Orthosia helva*, Grt. Coldstream, Ont. Aug. 23, (Wood).
- 2,235. *Parastichtis discivaria*, Wlk. Regina, Aug. 7, (Willing).
- 2,255. *Epiglaea decliva*, Grt. Cartwright. At sugar Sept. and Oct. At first by the faint light of collecting lamp, confused with *Glæa inulata*; must have seen a dozen or more. Not noticed in previous years. (Heath.)
- 2,259. *Calymnia orina*, Grt. Grand Bend, Lake Huron, July 20, (Saunders).
- 2,288. *Nycterophata luna*, Morr. Aweme, June 25, (Criddle). A most beautiful silvery white species, now first recorded from Canada.
- 2,302. *Heliothis scutosus*. Vernon, very common, Aug. 11, (Harvey). Kaslo, one specimen, (Cockle).
- 2,332. *Schinia trifasciata*, Hbn. Grand Bend, Lake Huron, Aug. 20, (Saunders).
- Pseudotamila Avemensis*, Dyar. Aweme, Aug. 1, taken in some numbers in the sand hills, near a tamarac swamp on the flowers of *Helianthus petiolaris*, in the daytime. (Criddle). Two freshly-emerged specimens were taken crawling quickly over the hot sand in the same locality, July 18. (Fletcher and Criddle.)
- 2,494. *Autographa rubidus*, Ottol. Ottawa, (Young). Only one specimen.
- 2,496. *Autographa brassicæ*, Riley. Toronto, Sept. 2, (Saunders).
- 2,498. *Autographa oxygramma*, Geyer. London, (Bethune). Toronto, (Saunders). Orillia, (Grant). A southern species.
- 2,508. *Autographa vaccinii*, Hy. Edw. This was recorded in 1903 as "very common at St. John, N.B." (McIntosh); but Dr. Ottolengui writes recently: "I obtained material from Mr. McIntosh, so labelled, but they were *octoscripta*. I am moderately certain that *vaccinii* has never been found except on Mount Washington, or the neighboring peaks."
- 2,519. *Autographa falcigera*, Kirby, a. *simplex*, Gn. Very abundant on red clover at Vernon in August. Not I think previously recorded from Brit. Columbia. (Harvey.) Mr. Venables also found it common at Vernon.
- 2,528. *Autographa Sackenii*, Grt. Mayo Lake, Yukon, Aug. 7, (Keele).
- 2,540. *Ogdoconta cinereola*, Gn. London, July 22, (Bethune).
- 2,548. *Pæctes oculatrix*, Grt. Aweme, June 20, (Criddle). A striking species. See figure in Holland's Moth Book, Plate 29, f. 4.
- 2,601. *Eustrotia albidula*, Gn. London, June 25, (Bethune).
- 2,604. *Eustrotia concinnimacula*, Gn. Trenton, June 7, 2 sp. (Evans).

- 2,826. *Catocala relictæ*, Wlk. Millarville, Sept. 3—5, at light and sugar. Never before seen on Pine Creek. (Dod.)
- 2,827. *Catocala cara*, Gn. Coldstream, Ont. Aug. 27, (Wood).
- 2,829. *Catocala marmorata*, Edw. Hyde Park, Ont., Aug. 21, (Morden).
- 2,839. *Catocala aspasia*, Strk. Cartwright, only one, (Heath).
- 2,855. *Catocala faustina*, Strk., b. *verecunda*, Hulst. Cartwright, (Heath).
- 2,856. *Catocala irene*, Behr. New Westminster, (W. A. Dashwood-Jones).
- 2,856. *Catocala irene*, Behr., b. *volumnia*, Hy. Edw. Victoria, Sep. 15, (Hanham).
- 2,866. *Catocala innubens*, Guen. and *C. scintillans*, Grote. Hyde Park, Ont., Aug. 23, (Morden).
- 2,905. *Catocala gracilis*, Edw. Ottawa, (Young).
- 2,923. *Remigia repanda*, Fab. Abundant, Toronto, Sept. 29.—Oct. 10, (Saunders).
- 2,991. *Homoptera calycanthata*, S. & A. Kaslo. Fairly plentiful, several beautiful varieties, one with bright blue banding. (Cockle.)
- 3,002. *Homoptera duplicata*, Bethune. Wellington, (Taylor). New to B. C. list.
- 3,022. *Zanclognatha obscuripennis*, Grt. Vernon, July, (Venables).
- 3,024. *Zanclognatha ochreipennis*, Grt. London, July 14, (Bethune).
- 3,159. *Cerura scitiscrita*, Wlk., a. *multiscripta*, Riley. Aweme, June 15, (Criddle).
- 3,211. *Tolyte laricis*, Fitch. Trenton, one specimen Sept. 17, (Evans).

GEOMETRIDÆ.

Canadian collectors have devoted considerable attention to these interesting moths during the past season, and many have taken advantage of the kind offer made by Rev. G. W. Taylor to identify their material. Mr. Taylor has furnished me with the following interim report, and fuller papers will appear later.

“At the request of Dr. Fletcher I gladly furnish some notes on the principal species of Geometridæ referred to me during the year by Canadian collectors.

Beginning at the east.—I have been able through the kindness of Mr. A. F. Winn, of Montreal, to see specimens of most of the species occurring at Montreal and Quebec. Three are additions to the list.—

Rachela bruceata, Hulst.

Plagodis serinaria, Herr-Sch.

Cleora umbrosaria, Hübner.

Two species were on the list ‘Geometridæ taken at Quebec and Montreal,’ by G. E. J. Bowles, Can. Ent., XV., p. 164., under other names, viz.: *Rheumaptera sociata*, as *Rheumaptera unangulata*, and *Therina fiscellaria*, as *Therina fervidaria*. With regard to the first of these,—In all the old lists and collections the insect stands as *R. unangulata*. Whether the true *Hydriomena unangulata*, as it is now called, really occurs in America or not I cannot say of my own knowledge. I have a good series of European specimens, but have not so far seen any taken in North America. The specimens from Montreal, Winnipeg and British Columbia, of which I have seen very many, are quite clearly all *Rheumaptera sociata*.

With regard to the *Therinas*, formerly *Therina fervidaria*, Hubner, and *T. fiscellaria*, Guenee, were considered to be one species, which went under

the older name of *fervidaria*. (See Packard's Monograph, p. 493.) This name, therefore, was the one placed on the older lists. The two forms are now considered distinct; but it is the form *fiscellaria* that is so abundant in Canada and of which our western *somniaria*, Hulst, is the representative. *T. fiscellaria* and *T. somniaria* feed as larvæ on deciduous trees, while *T. fervidaria* feeds on Conifers.

From Ottawa I have received a number of splendid specimens from Dr. James Fletcher and Mr. C. H. Young; indeed, the insects sent by the last named are more beautifully set up than any I have ever seen in any collection.

Mr. Young has sent me the true *Nyctobia vernata*, Packard, under which name one usually receives *anguilineata*, Grote, (*fusifasciata*, Walker).

He has also sent me specimens of the moth which stands on our lists as *Eustroma prunata*, L.

Mr. Young's specimens, however, are not really conspecific with this European insect. Neither do they agree with our western form, which Dr. Hulst separated under the name *Neolexia xyliana*. For the present I have placed the Ottawa moth in my cabinet as *Eustroma triangulata*, Packard, (5th Rept. Peab. Acad. Science, p. 54.), as it is undoubtedly the form referred to by Dr. Packard under that name. I will point out the differences between the three forms: *prunata*, *triangulata* and *xyliana* in a paper on our American Eustromas, which I hope shortly to publish.

Mr. Young has also sent me a beautiful specimen of *Anaploides remotaria*, Walker, taken at Meech Lake, Que. Among the moths sent by Dr. Fletcher were specimens of *Eupithecia interrupto-fasciata*, from larvæ found by Mr. W. Metcalfe on *Juniperus communis* in May. This was considered by Packard himself (Monograph, p. 52.) to be a synonym of *Eupithecia miserulata*, Grote, and in the Monograph Packard actually reprints his own description of *interrupto-fasciata* almost word for word as the description of *miserulata*. The American *Eupithecia* are in a state of great confusion (See note at end of this paper). Nearly all the specimens sent out by eastern collectors bear the label *E. miserulata*, and two or three different larvæ have been described under this name. (Compare the descriptions in Packard's "Insects injurious to Forest and Shade Trees, 1890." pp. 190, 910 and 919.) But if Grote's original description is to count for anything, his species is quite different from Packard's and easily to be distinguished.

Miserulata has a linear discal spot on the fore wing and is *without* any black band on the 2nd segment of the abdomen. It flies in April and May.

Interrupto-fasciata has a large round discal dot and a distinct black band on the 2nd segment of the abdomen. It flies in August.

Several collectors have been good enough to furnish me with specimens from Manitoba, and, as a result, I can add 14 species to Mr. Hanham's list published in the Canadian Entomologist, vol. XXXIII., p. 213 et seq.

Rheumaptera luctuata, Dennis & Schiff. Aweme, (Criddle).

Cinglis ancillatæa, Hulst. Aweme, (Criddle).

Synchlora liquoraria, Guenee. Aweme, (Criddle).

Macaria infimata, Guenee. Cartwright, (Heath).

Homochlodes fritillaria, Guenee. Winnipeg, (From Dr. W. Barnes.)

Cleora pampinaria, Guenee. Winnipeg, Cartwright, Aweme.

Therina fiscellaria, Guenee. Cartwright, (Heath). Beulah, (Dennis).

Ennomos magnarius, Guenee. Cartwright, (Heath).

Gonodontis duaria, Guenee. Beulah, (Dennis). Aweme, (Criddle).

Euchlæna astylusaria, Walker. Aweme, (Criddle).

Euchlæna marginata, Minot. Cartwright, (Heath). Aweme, (Criddle).
Eutrappela kentaria, Grote. Winnipeg, (Hanham).
Caberodes majoraria, Guenee. Cartwright, (Heath).
Sabulodes (?) *furciferatæ*, Packard. Cartwright, (Heath).

Mr. T. N. Willing sent me a nice lot of moths from Regina and some points in Alberta.

Among them were the following:—

Rheumaptera rubrosuffusata, Packard. 'North of Olds, Alberta,' 25, iv., 97.
Annemoria bistriaria, Packard. Lethbridge, 11, vii., 04. New to Canadian list.

Pherne jubararia, Hulst. Olds, 19, ix., 98.

Euchlæna marginata, Minot. 'North of Olds, Alberta,' 8, vi., 98.

and a long series of what I take to be *Cymatophora bitactata*, Walker. These last were taken at Regina in August of the present year.

Mr. F. H. Woolley Dod, of Calgary, has sent me a complete series of his captures in this family. It contains many difficult forms and several undescribed species, but I must defer comment on them, for the present as I feel they are entitled to be dealt with in a separate paper. The Calgary district furnishes many additions to the Canadian list. Its fauna includes a large number of Manitoba species with a sprinkling of Pacific coast forms, e.g. *Mespleuca gratulata*. There are also of course a large number of species peculiar to the Rocky Mountain region. I may here very gratefully acknowledge Mr. Wolley-Dod's liberality and the great help he has given me.

In British Columbia the year has been made memorable by the publication of Dr. Dyar's elaborate paper on the Kaslo Lepidoptera.

In this paper Dr. Dyar has described the following species and varieties as new to science and therefore of course new to Canada:

Tallegeda montanata, Packard, var. *magholiatoidata*, Dyar.

Tephroclystia niphadophilata, Dyar.

" *cootenaiata*, Dyar.

" *cosloata*, Dyar.

" *columbiata*, Dyar.

" *bifasciata*, Dyar.

" *subfoveata*, Dyar.

Mesoleuca simulata, Hubner, var. *Otisi*, Dyar.

Aplodes rubrifrontaria, Packard, var. *Darwiniata*, Dyar.

Macaria minorata, Packard, var. *incolorata*, Dyar.

Selidosema humarium, Guenee, var. *emasculatum*, Dyar.

Melanolophia canadaria, Guenee, var. *subgenericata*, Dyar.

I shall not be surprised if the two last named prove to be not new varieties, but new species.

Dr. Dyar has also identified the following European species of geometridæ amongst his Kaslo captures:

Tephroclystia laquaria, Herr-Sch.

" *satyrata*, Hubner.

" *lariciata*, Freyer.

Eucymatoge linariata, Fabricius.

Mr. Cockle, of Kaslo, to whom is due the credit for the discovery of this rich field has most generously placed in my collection specimens of nearly all the species of Geometridæ taken in his neighborhood.

Mr. E. P. Venables, of Vernon, B.C., sent me a few moths, and among them to my surprise was a specimen of *Sabulodes lorata*, Grote, taken at Vernon, and two specimens of *Eudule mendica*, Walker, also taken at Vernon last June. I should not have expected to find either of these well known eastern species west of the Rocky Mountains.

Mr. R. V. Harvey collected in the Vernon district for a few days in August last and has sent me from amongst his captures :

Cymatophora sulphurea, Packard, taken 15th August, 1904. The first recorded from B. C., and

Eois Californiaria, Packard. I think the real thing and distinct from *Leptomeris sideraria*, Guenee, with which Dr. Hulst united it.

Mr. Harvey has also generously given me a specimen, taken in May, 1903, of *Nyctobia viridata*, Packard. I cannot see any difference between this specimen and others received from New Brighton, Pennsylvania. This species was made the type, by Dr. Hulst, of a new genus *Cysteopteryx*; but though *viridata* is named as the type, the characters of the genus are evidently drawn from a different insect. (See Pearsall, Can. Ent. xxxvi., p. 208.) Hulst afterwards redescribed this species as *Agia eborata*; but this of course falls before Packard's older one.

It appears to me that neither *Cysteopteryx* nor *Agia* can be recognized as valid genera and that the species *viridata* must for the present at least remain in the genus *Nyctobia*.

On Vancouver Island, at Victoria, Goldstream, Duncans and Wellington, large collections have been made.

A new species of *Eupithecia* has been found in the collection of Mr. E. M. Anderson and named *E. harlequinaria* by Dr. Dyar, and a new species *Gabriola Dyari* has been described by myself in Can. Ent., xxxvi., p. 255. *Hydriomena reflata*, Grote, has been taken by Mr. Anderson rather commonly at Victoria, and I owe a fine series in my collection to his generosity.

Plagodis approximaria, Dyar. A fine pair of this, the most beautiful species in the genus, was bred by me from larvæ found in September, 1903, and another specimen was taken on the wing by Mr. Bryant, at Wellington, in May.

Phengommatata Edwardsata, Hulst. A fine specimen of this rare moth was given to me by Mr. Joseph Richards, of Wellington.

Alcis latipennis, Hulst. This species occurred for the first time at Wellington, 27 August, 1904. Mr. Bryant took it last year at Cameron Lake in the last week of July.

Many other species of British Columbian Geometridæ merit a place on this list; but, as I am now engaged in preparing for publication in the Canadian Entomologist, a paper on the Geometridæ of this province, with descriptions of a number of new species, I think it best to reserve for it the bulk of my notes on the family.

In conclusion, I should like to say that, when the above mentioned paper is out of hand, I propose to attempt a revision of the North American species of the very difficult genus *Eupithecia*. I have about 60 species in my own cabinet at the present time, and I anticipate that at least 100 species will eventually be found to occur in North America. Very few of these moths are at all well known; and, indeed, the bulk of the species so far described could not be recognised by description alone or without comparison with the type specimens. I shall be very grateful if collectors in Canada and elsewhere will endeavour to collect series of these interesting

moths and allow me to see them. The metropolis of the genus in North America is evidently in the West, the eastern species being comparatively few, and, as I have shown above, are far from being well understood.

I will return specimens sent to me, determined to the best of my ability and will gladly give co-types of our new western species, as far as they will go, to those who are good enough to help me. It should be borne in mind that these small moths make much better specimens if spread while fresh. They suffer more or less damage in the process of relaxing, and a rubbed specimen in a genus in which species run so close together is comparatively useless."—G. W. Taylor.

The following notes on geometers have also been received :

- 3,501. *Cinglis fuscata*, Hulst. Goldstream, B.C.; flies freely by day on open hillsides, high up, May 24 to end of June. (Hanham.)
- 3,651. *Sciagraphia heliothidata*, Gn. Trenton, Aug. 6, one specimen, (Evans).
Gabriola Dyari, Taylor. Oak Bay, Victoria. I have taken this species here since 1901, Aug. 1 to 21, at light in close pine woods in one locality. (Hanham.)
- 3,782. *Nepytia phantasmaria*, Strk. Mr. Harvey writes that the locality given in last year's Ent. Record "Victoria" should have been Vancouver, as up to the present time he has no record of its having been taken on Vancouver Island.
- 3,840. *Selidosema excelsarium*, Strk. Goldstream, B.C., at rest May 24, (Hanham).
- 3,841. *Selidosema albescens*, Hulst. Oak Bay, Victoria, Aug. 23, one specimen, (Hanham).
- 3,876. *Apocheima Rachelæ*, Hulst. Millarville, one male at rest, May 9, (Hudson).
- 3,883. *Erannis defoliaria*, Clem., a. *vancouverensis*, Hulst. Kaslo. One male, Oct. 14, 1903; 3 males and 2 females, 1904, all taken under electric light. Not previously recorded from the mainland. (Cockle.)
- 3,976. *Synaxis pallulata*, Hulst. Oak Bay, Victoria, Sept. 10 to 13, several flying by day.

MICRO-LEPIDOPTERA.

There has been a most satisfactory and encouraging revival in the study of Canadian micro-lepidoptera. This has been in the largest measure due to the kindness and untiring work of Mr. W. D. Kearfott, who has examined and named for Canadian collectors during the past year, an enormous number of specimens. Mr. August Busck, who in the past has done so much for Canadians, during 1904, was specially engaged at the St. Louis Exhibition, but will always be willing to receive specimens of tineids for examination and for deposition in the U. S. National Museum. I again take the opportunity of pointing out the wisdom of Canadian collectors sending specimens of rare species to this international depository, where every conceivable care is taken to preserve the specimens and make them accessible for the use of students from the whole world. It is to be hoped that in time we may have in Canada a National Museum, where proper provision will be made for the preservation of representative entomological collections; but until that is done, undoubtedly it is the duty of Canadian collectors first to build up the collection of the Entomological Society of Ontario and then de-

posit as complete a series and as perfect specimens as are to be obtained in Washington, where not only is every courtesy extended to Canadian students by the officers in charge of the different departments, but better provisions are made for safe-guarding the specimens, than anywhere else.

Mr. Kearfott has taken a special interest in Canadian species and has kindly supplied me with the following condensed report of his work during the past year. Mr. Kearfott also makes the following generous offer:—"I have still a supply of separates of my 'Suggestions for Setting, Collecting and Breeding Micro-Lepidoptera,' which were published in Entomological News. I shall take pleasure in mailing a copy of these to anyone who will take the trouble to write and ask for it."

Mr. Kearfott writes as follows:—

"The acceptance of Dr. Fletcher's kind invitation to contribute a few notes on this subject, gives me the opportunity to congratulate the Canadian entomologists upon the rapid development of a wide spread interest in the study of and desire to know more about these the most beautiful of all of our Lepidoptera; and at the same time to thank all of them and express my obligation for the many opportunities given me for studying large and small collections from many localities, between Montreal and Vancouver. It is, of course, natural that interest in these small moths should awaken last; first, because it was necessary to acquire proficiency by handling and expanding the larger ones, and second, the very great difficulty, heretofore of getting specimens named. I know by experience that collectors have little use for species that have to be stored in their 'unknown' boxes, and to maintain the interest and incite greater enthusiasm the supply of names must be equal to the demand. Students in America have been very greatly handicapped, in the work of identification, by reason of the fact that descriptions are scattered through many publications, the majority European, and that the types likewise are not readily available for comparison. For instance, in the Tortricids, of which there are about five hundred species in Dyar's Catalogue less than ten per cent. of the types are in public museums, the balance being in inaccessible private collections in this country or in European collections. Hence, the doubt that must oftentimes remain, even after repeated readings of a description, which would be instantly dispelled by the sight of the type. It is my ambition to push these clouds of doubt and uncertainty away, and in their place let in the flood of sunlight of popular knowledge, and, to do so, purpose trying to build up at least two collections: one at the National Museum Washington, and one at the Entomological Society of Ontario's rooms at London, by depositing co-types or carefully compared named specimens where anyone can freely go and ask no favor. This work must necessarily be slow, but, with the continued assistance of my good friends in Canada, it will be expedited to the full extent of my ability. There is an explanation running through these remarks that will be recognized as an apology by some, whose specimens have been retained apparently entirely too long, but, it must be remembered, that even those of us who have worked the hardest over descriptions and structural characters, are little more than beginners, yet groping along in the dark, thinking they are sure of an identification one day and doubtful the next, but always hoping and waiting for the something to turn up that will evolve certainty out of doubt.

For all of these reasons, a list of notable captures, is not an easy thing to prepare, practically all Micro-Lepidoptera captures are notable, inasmuch as Canadian records are almost entirely barren of their names. But

a goodly start will be made during 1905 in the pages of the *Canadian Entomologist* towards a Canadian list, that I hope to see largely added to from year to year.

From Mr. T. N. Willing, Regina, the following are of especial interest:

Olethreutes vetulana, Wlsm. Recorded from California and Texas.

Eucosma argentialbana, Wlsm. Recorded from Texas.

Eucosma culminana, Wlsm. Recorded from California.

Eucosma illotana, Wlsm. Recorded from Oregon.

Thiodia parvana, Wlsm. Recorded from Oregon.

Semioscopsis inornata, Wlsm. Locality 'unknown' in Dyar's Catalogue; this is first record of locality.

From Mr. Norman Criddle, Aweme, Man., a large and beautifully expanded collection, two of which must be noted here.

Pseudogalleria inimicella, Zell. Hitherto only taken in the Atlantic States.

The larvæ are borers in the stems of *Smilacæ*. (Busck.)

Eucosma Scudderiana Clem. Common in Eastern States, not before recorded from so far west.

I have also received from Manitoba, very interesting lots from Mr. E. Firmstone Heath and Mr. A. J. Dennis, a complete paper on all of this Manitoba material will shortly appear in the *Canadian Entomologist*.

From Rev. G. W. Taylor and Mr. Theodore Bryant very complete collections of Vancouver Island specimens. A paper on these will follow that on the Manitoba material.

From Mr. C. H. Young, Hurdman's Bridge, near Ottawa, Ontario, the most beautifully prepared examples I have ever seen of about seventy species, some of them new. His list will appear elsewhere. From Ontario I have also a small collection from Mr. H. S. Saunders, of Toronto, and another from Mr. Albert F. Winn, of Montreal, whose records of captures will be elsewhere recorded.

It may not be amiss to state that at the present time the localities that have been the least worked and from which the most valuable material can be expected, are Eastern Canada, the Maritime Provinces, and of course all of the territory north of Eastern Canada. Both Mr. Young's and Mr. Winn's collections contain many surprises, and throughout the extreme eastern region will be found species, hitherto only known from Labrador and Northern Maine and doubtless connecting links with the European fauna. It is hardly necessary to add that my services are always at the disposal of anyone wanting names of species of the families in which I am working."—W. D. Kearfott.

Among the specimens of *Micros* reared at Ottawa was one of more than usual interest *Simæthis Fabriciana*, L., several specimens of which were bred by Mr. Arthur Gibson from larvæ collected 24th May, 1901, in the tips of stinging nettles (*Urtica gracilis*). Specimens were again reared by Mr. Young last summer. Mr. Kearfott says of this moth that it is a European species never previously recorded from America. The Ottawa specimens are slightly larger than the typical form.

Another small moth, of considerable interest from the injury done by the larvæ to the young twigs of the Ash-leaved maple in Manitoba and the Northwest Territories, has recently been named *Proteopteryx Willingana*, by Mr. Kearfott. (Can. Ent., xxxvi., p. 306.)

COLEOPTERA.

(Arranged according to Henshaw's List of the Coleoptera of America, North of Mexico.)

As announced in the Entomological Record of 1903, Mr. E. D. Harris, of 280 Broadway, New York, has been paying special attention to Canadian Cicindelidæ, and has very kindly supplied me with the following notes on the rarer species which have come into his hands. Some further records shown between brackets—have been kindly sent to me by Mr. C. W. Leng, of 83 Reade Street, New York, another well known student of these beetles.

18. *Cicindela longilabris*, Say. Cape Breton, taken by A. D. McIntyre. Black, or very dark brown (corresponding with the form as taken freely in the Province of Quebec, at Mt. Desert on the Maine coast, and sparingly in August, 1904, in the Adirondack mountains in N.Y.); humeral and post-humeral dots, slender middle band often broken, and small sub-apical dot. July and August.

18c. *longilabris*, Say, var. *montana*, Lec. A single specimen sent me by Mr. Venables, taken at Vernon, B.C., April. [Aweme, Man., Criddle, (C.W.L.) Regina (Willing).]

longilabris, Say, var. *Kaslo*, B.C., and vicinity, taken by Mr. Cockle. Brilliant green (occasionally blue) and deep bronze brown, highly metallic, with all intermediate shadings of color; humeral lunule either entire or broken; middle band broader than in type and frequently extended at margin, anteapical dot. May, August and September.

25b. *purpurea*, Oliv., var. *graminea*, Schaupp. Vernon, B.C. Sent to me by Mr. Venables. A single specimen in the series approaches the typical insect of Olivier in its colorings; but the others closely correspond to Schaupp's description.

25f. *purpurea*, Oliv., var. *limbalis*, Klug. Cape Breton, taken by Mr. McIntyre, represented by but two specimens, in one of which the middle band is less sinuate and shorter, and in the other much more deflexed and extended than in the P. Q. race. There is no doubt as to the identification, but the specimens would seem to indicate a wide divergence in a series from this region. August. [Aweme, Criddle (C.W.L.)]

32 *vulgaris*, Say. Cape Breton, taken by Mr. McIntyre; a single specimen of the *horiconensis* form of Mr. Leng, (Revision of Cicindelidæ, Trans. Am. Ent. Soc., XXVIII.), but with markings more attenuated than usual. August.

Kaslo, B.C., and vicinity, a very large series taken by Mr. Cockle. The variety has distinctive characters; more slender and arched than type; humeral lunule broken and the anterior portion often absent; middle band scarcely touches the margin; apical lunule generally complete, often strongly accentuated, occasionally broken; color variable, from coppery bronze to a dull green bronze. April to October, very plentiful at the close of season. The same variety was taken in April at Vernon by Mr. Venables.

Calgary, N.W.T., taken by Mr. Willing, the variety generally recognized as *obliquata*, Dej., distinguished by the broad markings, entire humeral lunule, middle band extended at the margin, and apical lunule entire and strongly accentuated. In the series

from Calgary there is no variation in color; the greenish reflections and metallic lustre so pronounced in the Kaslo form are absent. [Aweme, Criddle. (C.W.L.)]

- 33c. *duodecim guttata*, Dej. Cape Breton, taken by Mr. McIntyre. In the series of one hundred specimens no divergence from the type in maculation is noticeable, but the variation in color mentioned by Mr. Leng in the Revision is quite apparent, many individuals being dull grayish green, and a single one is blue. Abundant in August.
- 33d. *oregona*, Lec. Kaslo, B.C., and vicinity. In a very large series from Mr. Cockle, the adherence to the type form is universal in the maculation, but the variation in color that is noticed in the Cape Breton specimens of 33c. *duodecim guttata*, occurs here, the tendency being towards a blue gray tone in many specimens. It seems to be plentiful through the summer.—E. D. HARRIS.
- 19d. *Cicindela rugifrons*, Dej. Longueuil, Que., Aug. 3, (Stevenson.)
153. *Elaphrus cicatricosus*, Lec. Aweme, June 2, (Criddle.)
378. *Bembidium Oberthuri*, Hayw. Aweme, April 26, an uncommon species, (Criddle). This is "*B. viridicolle*, Laf." of Mr. Hayward's revision of the genus, but the true *viridicolle* is known only from Texas.
550. *Pterostichus punctatissimus*, Rand. Rimouski, Que., June, (Mr. Beaulieu.)
711. *Diplochila impressicollis*, Dej. Aweme, May, June, (Criddle.)
752. *Pristonychus complanatus*, Dej. Victoria. A pair under bark, Feb'y., (Hanham). This is a European species occasionally taken in North America. A very interesting capture.
753. *Pristonychus terricola*, Hbst. St. John, (McIntosh). Prof. Wickham writes of this: "The first American specimen I have seen, although it was already known to occur in this country as well as in Europe."
795. *Platynus carbo*, Lec. Trenton, Sept. 29, (Evans).
- 1,244. *Laccophilus proximus*, Say. Aweme, June 16, (Criddle).
- 1,646. *Hydrobius scabrosus*, Horn. Vancouver, April 11, (Harvey). Metlakatla and Inverness, B.C., (Keen).
- 9,508. *Lomechusa montana*, Casey, var. *hirsuta*, Wasm. Aweme, in nest of wood ants (*Camponotus*), July 30, (Criddle). The varietal identification is provisional (H.F.W.).
- 2,140. *Staphylinus rutilicauda*, Horn. Goldstream, B.C., May 24, a pair under stones, June 1, 1901, (Hanham). Vancouver, (Harvey). A rare and beautiful species.
- 2,234. *Philonthus aurulentus*, Horn. Aweme, May 12-28, (Criddle). Interesting for locality.
- 2,434. *Stenus croceatus*, Casey. Trenton, June 19, (Evans).
- 2,820. *Tanyrhinus singularis*, Mann. Vancouver, Feb. 28, (Harvey). This remarkable and very rare staphylinid is figured in Can. Ent., vol. XXIX, p. 287.
- 3,105. *Hyperaspis undulata*, Say. Trenton, 1 sp. May 4, (Evans).
- 3,380. *Canoecelis ferruginea*, Sahl. Trenton, one at light, July 16, (Evans).
- 3,739. *Meligethes mutatus*, Harr. Aweme. Very plentiful on flowers of *Erysimum arkansanum*, July, (Criddle).
- 3,916. *Lara avara*, Lec. Vancouver, July 15, (Harvey). Prof. Wickham says: "One of the rarest of North American beetles previously known only from California. The first Canadian record."

- 3,984. *Aræopus monachus*, Lec. Vancouver, May 2, (Harvey).
 4,081. *Adelocera oblecta*, Say. London, May 24, (Bethune).
 4,095. *Alaus melanops*, Lec. Shawnigan Lake, B.C., July 1, (Hanham).
 5,514. *Aphodius erraticus*, L. A European species which has been found around Baltimore and has now been taken under stones on waste ground at Montreal, May 1, (K. R. Stevenson).
 5,524. *Aphodius congregatus*, Mann. Vancouver, several, March 19, (Harvey).
 5,568. *Aphodius prodromus*, Brahm. Trenton, May and October, (Evans). This is now one of the commonest dung beetles in Central Ontario.
 5,983. *Opsimus quadrilineatus*, Mann. Elk Lake, Victoria, August, (Hanham).
 6,005. *Phymatodes decussatus*, Lec. Victoria, 2 sp., June 26, July 1, (Hanham).
 6,013. *Callidium vile*, Lec. Goldstream and Victoria, June, (Hanham).
 6,101. *Callimoxys sanguinicollis*, Oliv. St. Hilaire, Que., one pair in blossoms of cherry, May 24, (Chagnon).
 6,161. *Stenophenos notatus*, Oliv. Montreal, one specimen, on log, June 12, (Chagnon).
 6,201. *Neoclytus erythrocephalus*, Fab. London, July 8, (Bethune).
 6,219. *Atimia dorsalis*, Lec. Vancouver, May 13, (Harvey).
 6,226. *Necydalis lavicollis*, Lec. Vancouver, (Harvey).
 6,228. *Ulochætes leoninus*, Lec. Vancouver, May 18, (Bush.) A rare and remarkable beetle.
 6,239. *Toxotus flavolineatus*, Lec. Goldstream, July, 1901, (Hanham). One on the wing, Shawnigan Lake, (Harvey). A rare and handsome beetle.
 6,250. *Pachyta rugipennis*, Newm. Hull, Que. About 40 specimens of this handsome longicorn were taken by Mr. W. Metcalfe pairing at the base of a dead pine tree on 29 May last. Originally described from Canada, but very rare.
 6,335. *Leptura vagans*, Oliv. London, June 25, (Bethune).
 6,345. *Leptura biforis*, Newm. St. John's, Que., July 8, (Chagnon).
 6,361. *Leptura mutabilis*, Newm., black var. Levis, Que., (Rev. Elias Roy).
 6,440. *Hyperplatys aspersus*, Say. Montreal, June 12, beaten off willows, four specimens, (Chagnon).
 6,454. *Pogonocherus Oregonus*, Lec. Victoria, July 27, 1902, one specimen only, (Hanham).
 6,479. *Saperda mutica*, Say. Montreal, July 14, on willow, (Chagnon).
 6,487. *Saperda puncticollis*, Say. London, June 9, (Bethune). Montreal, June 12, (Chagnon); Ottawa, on grape vine, July 5, (Guignard).
 6,538. *Donacia pubescens*, Lec. St. Hilaire, Que., July 1, (Stevenson, Chagnon).
 6,771. *Graphops nebulosus*, Lec. Aweme, April, May, (Criddle). "Interesting for locality and will probably be found in numbers later." (H. F. Wickham).
 6,814. *Chrysomela pnisra*, Stal. St. Hilaire, Que., May 24, (Mrs. C. Stevenson).
 6,827. *Plagioderma oviformis*, Lec. Aweme, June 11, (Criddle).
 7,654. *Emmesa connectens*, Newm. St. John, (McIntosh). This is an elongate beetle about one-third of an inch in length, blackish in color and each elytron bears an antemedian and apical spot of yellow.

- 7,713. *Priognathus monilicornis*, Rand. Vancouver, June 5, (Harvey). Widely distributed in the north but very rare. (H. F. W.)
- 7,724. *Calopus angustus*, Lec. Victoria, April 19. (Hanham). Metlakatlah, (Keen). "Rare in collections, ranges from California to Northern British Columbia." (H. F. W.) This is figured by Prof. Wickham, Can. Ent. XXX, p. 150.
- 7,782. *Mordella octopunctata*, Fab. London, July 16, (Bethune).
- 8,487. *Lixus rubellus*, Rand. Aweme, June 5, (Criddle).
- 8,513. *Stephanocleonus plumbeus*, Lec. Aweme, June, July, (Criddle). "Described from Lake Superior and New Mexico, quite rare." (H.F.W.)
- 8,581. *Lixellus filiformis*, Lec. Aweme, June 7, (Criddle).
- 8,628. *Acalyptus carpini*, Hbst. Aweme, May 15, (Criddle). Interesting for the locality.
- 8,629. *Coccotorus scutellaris*, Lec. Aweme, Aug. 28. I found this insect common in the stones of the Sand Cherry (*Prunus pumila*), (Criddle.)
- 8,714. *Conotrachelus nenuphar*, Hbst. Aweme, June 30, July 8, (Criddle). The wild plum (*Prunus nigra*) is common in Manitoba; but I have no record of injury to the fruit by the Plum Curculio. The beetle also attacks the haws of *Crataegus*.
- 8,835. *Coeliodes acephalus*, Say. Trenton. This is the first time I have ever taken this, June 19. (Evans.)
- 8,872. *Baris transversa*, Say. Trenton, May 5, (Evans).

HYMENOPTERA.

There are few records of work among the Canadian hymenoptera during the past season. Mr. Harvey, of Vancouver, Mr. Hanham, of Victoria, B.C., and Mr. Willing, of Regina, N.W.T., have collected in all families of this order; and Mr. E. P. Venables, at Vernon, B.C., has made a specialty of the *Bombi*. The distribution of the species is being worked out, and reference to rarities is held over for the present. Several of our lepidopterists are paying attention to hymenopterous parasites, which is a subject much requiring special study.

ORTHOPTERA.

Dr. E. M. Walker, of Toronto, has named several collections of Canadian material and is publishing results of his examinations in the *Canadian Entomologist*. Mr. Venables, of Vernon, B.C., Mr. Willing, of Regina, N.W.T., and Mr. Criddle, of Aweme, Man., are accumulating material. Mr. A. N. Caudell, has published some notes on British Columbian and Northwest species.

Blattidæ.

During the past summer there have been three interesting records of the occurrence in Canada of the beautiful southern cock-roach, *Panchlora viridis*, Burm. Two specimens are reported from Montreal by Mr. Charles Stevenson, one having been taken on the sidewalk in the street and the other flying around a lamp in a neighbor's house. The evidence was that these specimens had been introduced in bunches of bananas. Mr. Stevenson also collected under similar circumstances some other species of cock-roaches which had also been introduced with bananas. Another specimen was found by Miss

Dorothy Coates, at Winnipeg, inside a box of candies purchased at the Winnipeg exhibition. Mr. Cockle found a specimen of *Panchlora viridis* at Kaslo, B.C., which he believed had been introduced with bananas. Under lepidoptera, reference is made to *Ceramidia Butleri*, a moth from the South which came into Canada in the same way and was found by Mr. Cockle at Kaslo.

NEUROPTERA.

Mr. G. W. Taylor and some of the British Columbian members have begun, with the help of Mr. Nathan Banks, to work up the Neuroptera, Trichoptera and Plectoptera of their Province and several new species have been discovered.

DIPTERA.

Bittacomorpha clavipes, Fab. London, June 18, (Bethune).

Xylophagus fasciatus, Walk. Vancouver, May 24, (Harvey).

Sargus viridis, Say. High River, Alta., (T. Baird).

Nemotelus nigrinus, Fall. Ottawa, June 26, (Metcalf).

Chrysops proclivis, O. S. Vancouver, June 4, (Harvey).

Chrysops mitis, O. S. Weyburn, Assa., June 21, on horses, (Willing).

Chrysops noctifer, O. S. Vancouver, June 4, (Harvey).

Triptotrichia lauta, Lw. Victoria, B.C., (Hanham).

Rhyphus punctatus, Fab. High River, (Baird).

Leptis dimidiata, Lw. Vancouver, June 11, (Harvey).

Leptis maculifera, Bigot. Mount Arrowsmith, B.C., July 28, (Fletcher).

Asilus notatus, Wied. Regina, July 4, (Fletcher).

Cyrtopogon præpes, Will. High River, (Baird).

Laphria vultur, O. S. Vancouver, May 15, (Harvey).

Anthrax alternata, Say. Victoria, (Hanham).

Anthrax fulviana, Say. Victoria, Sept. 13, (Hanham). Vancouver, Aug. (Harvey.)

Anthrax lucifer, Fab. Vernon, August, common, (Harvey).

Anthrax Sackenii, Coq. Fort Walsh, Aug. 23, (Willing).

Spogostylum analis, Say. Mission, B.C., common, Aug. 8 and 9, (Harvey).

Bombylius major, L. Ottawa, May 1, (Metcalf); Goldstream, B.C. May 17, (Hanham).

Bombylius lancifer, O. S. Okanagan Lake, B.C., May, (Venables).

Dipalta serpentina, O.S. Wellington, July 27, 29, (Harvey).

Systæchus oreas, O. S. Victoria, (Hanham).

Pterodontia flavipes, Gray, Boucherville Island, Que., July 25, (Stevenson).

Chrysotæxum pubescens, Lw. Spruce Grove, Alta., July 21, (Willing).

Melanostoma Kelloggi, Snow. Mer Bleue, near Ottawa, Aug. 23, (Fletcher).

Sericomyia chalcopyga, Lw. Vancouver, common, April-June (Harvey).

Eristalis Meigenii, Wied. Vernon, Aug. 15, (Harvey).

Helophilus latifrons, Lw. High River, (Baird).

Helophilus similis, Macq. Vernon, Aug. 15; Vancouver, Sept. 15, (Harvey).

Helophilus conostomus, Will. Vernon, Aug. 12, (Harvey).

Criorhina nigrines, Will. Vancouver, not common, April, (Harvey).

Criorhina tricolor, Coq. Mt. Arrowsmith, B.C. July 28, (Fletcher).

Pocota grandis, Will. Victoria, (Hanham). This is a rare species. Specimens will be acceptable at the National Museum, Washington.

- Brachypalpus pulcher*, Will. Victoria, (Hanham). Vancouver, May 7, (Harvey).
- Xylota barbata*, Lw. Vancouver, June 11, (R. Sherman).
- Physocephala Burgessii*, Will. Vancouver, June 4, (Harvey).
- Belvosia trifasciata*, Fab. High River, July 4, (Baird).
- Ocyptera Carolinæ*, Desv. Victoria, (Hanham).
- Exorista chelonice*, Rond. Victoria, (Hanham).
- Tachina mella*, Walk. Reared at Ottawa from larvæ of *Clisiocampa*, received from Lacombe, Alta.
- Phorichweta sequear*, Will. Indian Head, July 1, (Fletcher).
- Gonia capitata*, DeG. Vancouver, uncommon, May 14, (Harvey). Vernon, (Venables). Dr. J. B. Smith gives this as a parasite of *Peridroma saucia*.
- Epalpus signifer*, Walk. Olds, Alta., April 28, (Willing). Ottawa, May 1, (Metcalf). This handsome tachina was unusually common at Ottawa in 1904, (Fletcher).
- Lucilia sericata*, Meig. Vancouver, (Harvey).
- Bombyliomyia abrupta*, Wied. Vancouver, not common, May 14, (Harvey).
- Tephronota Canadensis*, Johnson. Ottawa, June 26, (Metcalf, Harrington).
- Trypeta occidentalis*, Snow. McLeod, Alta., July 5, (Willing).
- Tephritis albiceps*, Lw. Ottawa, June 26, (Metcalf).
- Sapromyza connexa*, Say. Mt. Arrowsmith, July 28, (Fletcher).

FURTHER NOTES ON BASSWOOD, OR LINDEN, INSECTS.

BY ARTHUR GIBSON, DIVISION OF ENTOMOLOGY, CENTRAL EXPERIMENTAL FARM, OTTAWA.

In the last Annual Report of this Society, 1903 (pages 50-61), the writer contributed a paper treating of 94 different species of insects which have been found attacking *Tilia Americana*, L. The season of 1904 was a remarkably poor one for insects of all orders in the Ottawa district, and consequently few additional observations were made, but such as were noted are presented herewith, along with one or two other records which were omitted from the above article.

ATTACKING THE FOLIAGE.

Order Orthoptera.

95. The Walking Stick Insect, *Diapheromera femorata*, Say. At the annual meeting of the Entomological Society of Ontario, held last October, Mr. J. B. Williams, of Toronto, spoke of the great abundance of the Walking Stick insect, at Niagara Glen, Ontario, in September, 1904, and said that the species did considerable damage, feeding on the foliage of a number of trees, particularly hickory, butternut and oak. He also told me that he was pretty sure they had been eating basswood. He has since confirmed this, stating that both Dr. Brodie and Dr. Walker, of Toronto, have also found the Walking Stick insect feeding on the basswood.

Order Coleoptera.

96. *Dichelonychia elongata*, Fabr. This common beetle occasionally does considerable damage to the foliage of a number of forest trees. The perfect insects have been observed at Ottawa feeding commonly on the leaves

of linden in June. Other trees upon which the beetles feed are birch, bitter hickory, elm, beech, oak, etc. The beetle is about one-third of an inch long, cylindrical, the body of a dark colour with the wing covers testaceous and more or less tinged with green. Beneath, the body is densely clothed with short white hairs, and is sparsely hairy above. The legs are long and slender, the hind ones being blackish.

Order Lepidoptera.

97. *Gluphisia septentrionalis*, Walker. This is a common species at Ottawa, the larvæ usually occurring on the aspen, *Populus tremuloides*. A single caterpillar of this notodontian, three-quarters of an inch in length, was found feeding on basswood at Ottawa on the 10th August. When mature the larva measures one and a quarter inches in length, and in general appearance is smooth, cylindrical, pale green, with a distinct yellow subdorsal band, and a series of bright red dorsal blotches on all the body segments excepting the abdominal 1st, 2nd and 10th. The head is darker than the body and has on each side a conspicuous black stripe.

98. *Heterocampa bilineata*, Pack. The larvæ of this species were fairly common at Meech Lake, Que., in 1901. Most of the specimens collected had been feeding about five feet from the ground, on the foliage of new shoots. Mature larvæ found by Mr. C. H. Young about the end of August produced moths the middle of the following June. Other food plants of the larvæ of this species are elm and beech. Notes on the larval stages may be found in Packard's "Bombycine Moths of America North of Mexico."

39 of 1903 list. *Coleophora tiliæfoliella*, Clem. One case of the larva of this tineid moth was found attached to a basswood leaf on the 21st June, 1904, the moth emerging on the 30th June. The imago was identified by Mr. W. D. Kearfott, who has sent a description of the moth for publication in the *Canadian Entomologist** This is the first record that we know of, of the species having been found in Ontario.

99. *Ellida caniplaga*, Walk. In Holland's Moth Book linden is mentioned as the food of the caterpillar of this notodontian. The moths have been taken infrequently at Ottawa, the dates of their capture being 13, 16, 17 May, 5, 8 June, and 6 July. We have never collected the larva.

Order Diptera.

68 of 1903 list. The Basswood Wart Gall, *Cecidomyia verrucicola*, O. S. This gall was very common on basswood leaves the past summer at Ottawa. It occurs irregularly in numbers on the same leaf, in numerous cases more than a hundred galls being found on the same leaf.

Order Acarina.

69 of 1903 list. The Linden Gall-mite, *Phytoptus abnormis*, Gorman. On the 27 July some leaves of basswood were received from Mr. Z. A. Lash, Four Way Lodge, Lake Rosseau, Ont., which showed the work of this mite.

* This description appeared in the November number, 1904.

OCCURRING ON THE BARK.

Order Homoptera.

100. *Eulecanium quercitronis*, Fitch. This large scale insect was found rather plentiful on the twigs of two large trees at Ottawa on the 28th May, 1904, and specimens were sent to Mr. Geo. B. King for identification. Basswood is not mentioned among the food plants of this species in Mrs. Fernald's catalogue of the Coccidae of the World, so this may be a new record of the food plant. On the 19 October further examples were collected from the same trees. These varied in size from 4.5 mm. to 6.5 mm. in length.

BORING INTO THE WOOD.

Order Coleoptera.

92 of 1903 list. The Northern Brentid, *Eupsalis minuta*, Drury. (Fig. 11). Among some insects sent to the Division for identification, by Mr. W. Wintenberg, of Toronto, was a specimen of this beetle, with the note "Two specimens found in a piece of basswood near Washington, Ont." This insect is widely distributed over the United States and Canada. It is chiefly an oak borer.

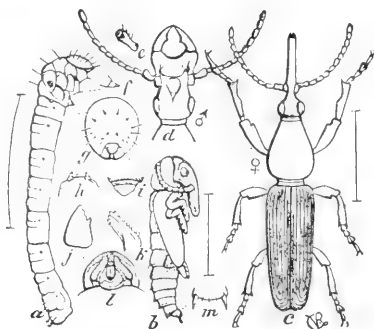


FIG. 11. The Northern Brentid (*Eupsalis minuta*), Drury.

101. *Clytanthus ruricola*, Oliv. Mr. W. H. Harrington tells me that he has taken specimens of this cerambycid on basswood stumps and from felled trees. Two dates which he gave me are the 9th and 10th July.

102. *Synchroa punctata*, Newman. The Melandryidæ, the family to which this insect belongs, are feeders in dry wood, dry fungi and dry vegetable matter generally. This particular species is about 5-10ths of an inch in length, of a brown colour, coarsely punctured and pubescent. Mr. Harrington found three pupæ under the bark of basswood at Ottawa, from which he bred the beetles.

NOTE ON THE COLUMBINE BORER .

(Papaipema purpurifascia, G. & R.).

BY ARTHUR GIBSON, OTTAWA.

An interesting occurrence of the larvæ of *Papaipema purpurifascia*, G. & R. was observed by the writer in the latter part of July, and beginning of August last. This borer cannot be considered a common species in Canada, but it seems to have the habit of occurring occasionally in sufficient numbers to do serious harm to cultivated plants of the genus *Aquilegia*. In 1893, Dr. Fletcher tells me, the larvæ of this species did considerable damage at Ottawa to columbine plants in gardens, but since that date it has not been seen until the present year, when it was noticed in several beds at the Central Experimental Farm. Specimens of the larvæ were also received from Mr. D. Francis, of Perth, Ont., on the 27th July, with the statement that they had destroyed nearly all of the *Aquilegias* in one of his gardens. He also stated that he had a similar visitation when living at Hamilton, Ont., some ten years ago. The most serious infestation this year at Ottawa occurred in a large bed of hybrids of the beautiful Russian variety, *Aquilegia oxysepala*. In this bed of 135 plants fully 70 per cent. were injured, many being killed outright.

Larvæ were found boring in the roots on the 28th July, all in their mature stage. Many had left the plants, doubtless to pupate, as three pupæ were found in the earth near the plants, and one pupa at the very base of the leaves, on the surface of the ground. On the 4th August more full grown larvæ were collected from the roots, also one pupa, and three other larvæ which had begun to pupate. These three latter and the pupa were found near the plants about an inch below the surface. At this date many of the infested plants showed noticeable sign of injury.

The larvæ bore inside the stems of the plants and gradually work their way down into the roots, which are large and tuberous. Here they consume the inner part and reach maturity. In many instances the whole of the inside of the secondary roots had been eaten, nothing being left but the outside covering. The following description was taken of the larvæ; Length, 37 mm.; one specimen measured 40 mm. at rest, and 46 mm. when extended, width at centre, 5.5 mm.; head well rounded, rather quadrate, slightly depressed at vertex, almost tawny, paler towards mouth parts which are dark; ocelli black in a black field; from ocelli to outer edge of the thoracic shield there is a dark band, more conspicuous in some specimens than in others. Thoracic shield, noticeably wider than head, almost the same colour but paler and margined distinctly on each side with black. Dorsum of body salmon colour, below spiracles paler with none of the salmon colour; some specimens much brighter dorsally than others. Dorsal stripe distinct, but pale, same colour as venter. Tubercles black each in a black spot, the size of which varies in different specimens; setae inconspicuous. Laterally there are also a number of black spots, some almost in a line with the spiracles, others above and below. Spiracles black, elongate. Anal shield in most specimens wholly black, but in some reddish centrally. Thoracic feet fulvous darkened at tips; prolegs pale.

From the above description it will be seen that the larvæ had a distinct dorsal stripe, but no subdorsal marking as is mentioned in the description of the mature larva by M. V. Slingerland (Can. Ent. XXIX, 161). In H. Bird's description of the full grown larva no stripes of any kind are mentioned.

Two of the larvæ which were found pupating on the 4th August had changed to pupa by the 5th August, and the moths emerged on the 30th August. Other moths emerged on the 18th and 25th August, and 2nd, 5th, 6th, 8th and 13th September.

The pupa is 20 to 25 mm. in length, and 5.5 to 7.5 mm. in width, at widest part; shiny, reddish brown, darker in the incisures; anterior third of each abdominal segment distinctly pitted, posterior third minutely pitted. Cremaster blackish, bearing two stiff spines, which are distinctly hooked at ends.

INSECTS COLLECTED AT LIGHT DURING THE SEASON OF 1904.

By J. D. EVANS, TRENTON.

The writer having collected, at light, at odd times in 1901-2 and 1903, usually commencing late in the season and then continued only intermittently, this season a start was made on the 6th of May and continued uninterruptedly, except when the weather conditions were against it, such as rain or extremely cold weather, and for ten days in August while the writer was called away from town.

On the whole the season was very wet and cool, frequent rains during the whole summer, which invariably ended in extremely cool weather. Rain fell on six days in the month of May, nine days in June, eleven in July, seven in August, ten in September, and six in October up to the 21st. many of the rainstorms being accompanied with thunder and lightning.

In former years very many specimens of leaf hoppers and parasitic Hymenoptera were taken, but this season very few of the former, and I may say none of the latter. It was noted that exceptionally few insects were observed coming into the house in the evenings, in fact, only upon one occasion were they observed at all. Consequently the captures were small, numerically, as compared with what they might have been if the season had been warm and dry, as is usually the case.

The trap was usually put out at dusk, and taken in the following morning between five and seven o'clock. Oftentimes there would be nothing in the trap by 10.30 or 11.00 p.m., but in the morning almost invariably no matter how much appearances would indicate a blank, a number of things would be found.

All insects of the orders Lepidoptera, Coleoptera, Hemiptera, Hymenoptera and Diptera, except the numerous midges and phrygania flies, would be assorted out each evening following the evening of capture, and one specimen at least of each species pinned, and the number of duplicates of that species indicated on a card, together with the date of capture affixed on the pin and put away for future reference.

In the case of rare moths all specimens would be spread, as also one or two perfect specimens of the commoner species. 126 species have thus far been named and classified. Many of the microlepidoptera yet remain to be determined, as well as about 16 species of the noctuidæ, etc.

The following is a list of the captures, with the number of specimens of each species, and the range of the dates of capture. The numbers are after Dyar's List.

787	<i>Scepsis fulvicollis</i> , Hubner	2 sp., 28 August and 12 September.
798	<i>Ctenucha virginica</i> , Charp.	2 sp., 20 June and 26 July.
808	<i>Hypoprepia fucosa</i> , Hubner	1 sp., 6 August.
851	<i>Estigmene acraea</i> , Drury	4 sp., 12 June—14 July.

855	<i>Hyphantria cunea</i> , Drury	2 sp., 15 June—19 July.
859	<i>Isia isabella</i> , S. & A.	4 sp., 23 June—29 August.
860	<i>Phragmatobia fuliginosa</i> , L.	2 sp., 19 July and 6 August.
862	<i>Diacrisia virginica</i> , Fab.	6 sp., 8 June—19 August.
874	<i>Apantesis virgo</i> , Linn.	11 sp., 16 July—31 July.
878	<i>Apantesis parthenice</i> , Kirby.	1 sp., 4 September.
968	<i>Raphia frater</i> , Grote	3 sp., 14 July—2 August.
1032	<i>Apatela distans</i> , Grote	1 sp., 5 August.
1049b	<i>Arsilonche Henrici</i> , Grote	10 sp., 7 May—9 August.
1084	<i>Catabena lineolata</i> , Walk.	6 sp., 12 July—5 August.
1087	<i>Crambodes talidiformis</i> , Gn.	1 sp., 25 July.
1166	<i>Hadena mactata</i> , Gn.	1 sp., 6 September.
1208	<i>Hadena basilinea</i> , Fab.	1 sp., 18 June.
1219	<i>Hadena suffusa</i> , Morr.	1 sp., 1 July.
1227	<i>Hadena dubitans</i> , Walk.	14 sp., 25 July—18 September.
1232	<i>Hadena devastatrix</i> , Brace	39 sp., 27 June—29 August.
1235	<i>Hadena arctica</i> , Boisdu	8 sp., 7 July—3 August.
1241	<i>Hadena verbascoides</i> , Gn.	1 sp., 20 June.
1278	<i>Hyppa xylinoidea</i> , Gn.	1 sp., 4 September.
1288	<i>Euplexia lucipara</i> , Linn.	3 sp., 7 June—15 July.
1295	<i>Pyrophila pyramidoides</i> , Gn.	3 sp., 9 September—12 September.
1297	<i>Heliotropha reniformis</i> , Grt.	1 sp., 5 September.
1422	<i>Eueretagrotis sigmoides</i> , Gn.	2 sp., 12 July.
1423	<i>Eueretagrotis perattenta</i> , Gr	1 sp., 8 July.
1462	<i>Peridroma occulta</i> , Linn.	1 sp., 15 August.
1478	<i>Noctua bicarnea</i> , Gn.	3 sp., 30 July—9 August.
1481	<i>Noctua c-nigrum</i> , Linn.	1 sp., 6 October.
1490	<i>Noctua plecta</i> , Linn.	9 sp., 7 June—14 September.
1493	<i>Noctua haruspica</i> , Gr.	5 sp., 19 July—1 August.
1538	<i>Feltia subgothica</i> , Haw.	45 sp., 6 August—19 September.
1540	<i>Feltia jaculifera</i> , Gn.	51 sp., 18 July—11 September.
1540d	<i>Feltia herilis</i> , Gr.	33 sp., 3 August—4 September.
1545	<i>Feltia venerabilis</i> , Walk.	6 sp., 12 September—20 September.
1549	<i>Feltia volubilis</i> , Harvey	1 sp., 23 June.
1552	<i>Porosagrotis vetusta</i> , Walk.	1 sp., 24 August.
1724	<i>Paragrotis obeliscoides</i> , Gn.	4 sp., 2 July—4 August.
1807	<i>Mamestra picta</i> , Harris	1 sp., 11 June.
1822	<i>Mamestra legitima</i> , Grt.	1 sp., 19 July.
1823	<i>Mamestra lilacina</i> , Harr.	1 sp., 13 June.
1829	<i>Mamestra renigera</i> , Stephens	4 sp., 20 June—2 August.
1842	<i>Mamestra lorea</i> , Gn.	14 sp., 18 June—9 July.
1950	<i>Nephelodes minians</i> , Gn.	93 sp., 24 August—18 September.
1957	<i>Heliophila luteopallens</i> , Smith.	101 sp., 6 June—5 October.
1963	<i>Heliophila albilinea</i> , Hubn.	2 sp., 9 July—3 August.
1975	<i>Heliophila insueta</i> , Gn.	5 sp., 11 June—23 June.
1979	<i>Heliophila commoides</i>	3 sp., 7 July—8 September.
1980	<i>Heliophila phragmadicola</i> , Gn.	3 sp., 31 July—17 September.
1997	<i>Orthodes cynica</i> , Gn.	1 sp., 12 June.
2015	<i>Graphiphora oviducta</i> , Gn.	29 sp., 1 June—21 June.
2040	<i>Graphiphora alia</i> , Gn.	1 sp., 7 May.
2060	<i>Tricholita signata</i> , Walk.	3 sp., 2 August—6 August.
2149	<i>Sphida obliqua</i> , Walk.	1 sp., 14 June.
2162	<i>Gortyna nictitans</i> , Bork.	3 sp., 9 August—29 August.
2187	<i>Papaipema cataphracta</i> , Gr.	8 sp., 18 September—5 October.
2192	<i>Papaipema marginidens</i> , Gn.	2 sp., 17 September—19 September.
2199	<i>Xanthia flavago</i> , Fab.	2 sp., 2 October and 5 October.
2203	<i>Brotolomia iris</i> , Gn.	1 sp., 6 June.
2207	<i>Scoliopteryx libatrix</i> , Linn.	1 sp., 1 July.
2222a	<i>Orthrosia ferruginoides</i> , Gn.	7 sp., 18 September and 19 October.
2430	<i>Euthisanotia grata</i> , Fab.	5 sp., 11 July—3 August.
2474	<i>Plusia ærea</i> , Hubner	3 sp., 19 June and 4 September.
2475	<i>Plusia æroides</i> , Gr.	2 sp., 18 July and 2 August.
2476	<i>Plusia balluca</i> , Geyer	2 sp., 21 July and 30 July.
2479a	<i>Enchalcia Putnami</i> , Gr.	1 sp., 29 August.
2483	<i>Autographa bimaculata</i> , Steph.	1 sp., 23 July.
2488	<i>Autographa precatonis</i> , Gn.	9 sp., 21 June—14 September.
2536	<i>Abrostola urentis</i> , Gn.	4 sp., 17 June—30 July.
2540	<i>Ogdoconta cinereola</i> , Gn.	5 sp., 12 June—12 September.
2568	<i>Rivula propinquialis</i> , Gn.	32 sp., 6 July—5 October.

2604	<i>Eustrotia concinnimacula</i> , Gn.	2 sp., 7 June.
2607	<i>Eustrotia muscoscula</i> , Gn.	5 sp., 21 June—11 July.
2613	<i>Eustrotia carneola</i> , Gn.	36 sp., 1 June—12 September.
2682	<i>Tarache cretata</i> , G. and R.	15 sp., 6 June—17 September.
2691	<i>Tarache candefacta</i> , Hub.	9 sp., 13 June—21 July.
2734	<i>Homopyralis contracta</i> , Walk.	2 sp., 7 July and 12 July.
2754	<i>Drasteria erechtea</i> , Cramer	35 sp., 6 June—7 August.
2911	<i>Euparthenos nubilis</i> , Hub.	1 sp., 1 July.
3098	<i>Datana ministra</i> , Drury	1 sp., 15 June.
3142	<i>Heterocampa bilineata</i> , Pack.	1 sp., 6 June.
3149	<i>Schizura concinna</i> , S. and A.	1 sp., 2 August.
3166	<i>Gluphisia septentrionalis</i> , Walk.	5 sp., 15 June—26 August.
3211	<i>Tolype laricis</i> , Fitch.	1 sp., 17 September.
3214	<i>Malacosoma americana</i> , Fab.	5 sp., 11 July—20 July.
3238	<i>Opheroptera boreata</i> , Hub.	1 sp., 4 November.
3248	<i>Endule mendica</i> , Walk.	3 sp., 8 July—11 July.
3327	<i>Eucymatoge intestinata</i> , Gn.	9 sp., 7 June—9 August.
3340	<i>Hydria undulata</i> , Linn.	1 sp., 11 July.
3348	<i>Eustroma diversilineata</i> , Hub.	1 sp., 12 July.
3349	<i>Eustroma testata</i> , Linn.	2 sp., 5 September and 11 September.
3370	<i>Peronoptilota fluviata</i> , Hub.	2 sp., 14 July and 20 July.
3371	<i>Mesoleuca ruficiliata</i> , Gn.	1 sp., 25 July.
3574	<i>Mesoleuca lacustrata</i> , Gn.	8 sp., 28 May—19 July.
3376	<i>Mesoleuca intermedia</i> , Gn.	13 sp., 7 May—9 August.
3402	<i>Hydriomena latirupta</i> , Walk.	1 sp., 29 September.
3409	<i>Hydriomena unangulata</i> , Haw.	1 sp., 15 June.
3419a	<i>Cenocalpe cumatilis</i> , G. and R.	2 sp., 12 June and 19 June.
3438	<i>Gypsochroa designata</i> , Hub.	15 sp., 20 May—11 September.
3487	<i>Synelys enucleata</i> , Gn.	2 sp., 18 July and 21 July.
3587	<i>Aplodes mimosaria</i> , Gn.	4 sp., 6 June—1 August.
3608	<i>Orthofidonia vestaliata</i> , Gn.	1 sp., 16 July.
3619	<i>Gueneria basilaria</i> , Walk.	2 sp., 18 June—8 July.
3623	<i>Deilinia variolaria</i> , Gn.	4 sp., 14 June—20 July.
3651	<i>Sciagraphia heliothidata</i> , Gn.	1 sp., 6 August.
3662a	<i>Sciagraphia atrofasciata</i> , Pack.	1 sp., 9 July.
2667	<i>Philobia enotata</i> , Gn.	1 sp., 19 June.
3690	<i>Cymatophora ribearia</i> , Fitch.	2 sp., 22 July and 31 July.
3865	<i>Lycia ursaria</i> , Walk.	1 sp., 14 May.
3867	<i>Lycia cognataria</i> , Gn.	1 sp., 14 July.
3884	<i>Erannis tiliaria</i> , Harr.	2 sp., 29 October.
3913	<i>Metrocampa prægandaria</i> , Gn.	1 sp., 5 September.
3923	<i>Ennomos magnarius</i> , Gn.	5 sp., 19 September—14 October.
3925	<i>Xanthotype crocatoria</i> , Fab.	4 sp., 19 June—11 July.
3939	<i>Ania limbata</i> , Haworth.	7 sp., 12 July—31 July.
3941	<i>Gonodontis hypochraria</i> , H. S.	1 sp., 14 June.
3981	<i>Metanema inatormaria</i> , Gn.	2 sp., 8 June—16 July.
3982	<i>Metanema determinata</i> , Walk.	2 sp., 19 July—27 July.
4001	<i>Azelina ancetaria</i> , Hub.	3 sp., 7 August—28 August.
4007	<i>Caberodes confusaria</i> , Hub.	1 sp., 11 July.
4011	<i>Tetracis crocallata</i> , Gn.	2 sp., 7 June.
4026	<i>Sabulodes transversata</i> , Drury	2 sp., 28 August.
4191	<i>Bembecia marginata</i> , Harr.	1 sp., 26 June.
4277	<i>Desmia funeralis</i> , Hub.	2 sp., 19 June and 16 July.
4336	<i>Evergestis straminealis</i> , Hub.	348 sp., 1 June—18 September. 41 dates.
4487	<i>Nymphula icciusalis</i> , Walk.	4 sp., 9 July and 21 July.
4492	<i>Nymphula badiusalis</i> , Walk.	16 sp., 9 July—12 September.
4521	<i>Herculia olinalis</i> , Gn.	5 sp., 9 July—19 July.
4545	<i>Schænobius melinellus</i> , Clem.	5 sp., 11 July—7 August.
4573	<i>Crambus laqueatellus</i> , Clem.	2 sp., 10 June—20 July.
4620	<i>Argyria nivalis</i> , Drury	47 sp., 1 July—11 September.
4622	<i>Argyria auratella</i> , Clem.	1 sp., 14 July.
5139	<i>Eucosma Scudderiana</i> , Clem.	1 sp., 19 June.
5331	<i>Epagoge sulfureana</i> , Clem.	9 sp., 9 July—19 September.
5661	<i>Tricotaphe nonstrigella</i> , Cham.	1 sp., 18 September.

Of Coleoptera 60 species were taken at light, viz.:

<i>Bombidium variegatum</i> , Say.	1 sp., 18 July.
<i>Bombidium sulcatum</i> , Lec.	1 sp., 9 July.
<i>Bombidium mimus</i> , Lec.	1 sp., 11 July.

<i>Amara laevis</i> , Kirby.	6 sp., 11 July—5 August.
<i>Amara</i> sp.	1 sp., 12 July.
<i>Platynus decorus</i> , Say.	1 sp., 29 September.
<i>Platynus carbo</i> , Lec.	1 sp., 18 July.
<i>Platynus placidus</i> , Say.	1 sp., 9 July—31 July.
<i>Lebia pleuritica</i> , Lec.	1 sp., 25 September.
<i>Lebia viridis</i> , Say.	2 sp., 11 September.
<i>Chlaenius tricolor</i> , Dej.	1 sp., 18 July.
<i>Agonoderus pallipes</i> , Fab.	4 sp., 3 May—14 September.
<i>Harpalus pennsylvanicus</i> , Dej.	15 sp., 18 July—5 August.
<i>Harpalus erythropus</i> , Dej.	17 sp., 11 July—6 August.
<i>Harpalus</i> sp.	2 sp., 9 July.
<i>Stenolophus ochropezus</i> , Say.	5 sp., 21 June—11 July.
<i>Acupalpus carus</i> , Lec.	1 sp., 9 July.
<i>Anisodactylus discoideus</i> , Dej.	3 sp., 9 July—18 July.
<i>Anisodactylus terminatus</i> , Say.	7 sp., 16 July—29 August.
<i>Ocelambus impressopunctatus</i> , Sch.	1 sp., 9 July.
<i>Helophorus lacustris</i> , Lec.	1 sp., 19 July.
<i>Hydrochus squamifer</i> , Lec.	2 sp., 16 July.
<i>Hydrobius fuscipes</i> , Linn.	4 sp., 16 July—6 August.
<i>Cercyon prae-textatum</i> , Say.	1 sp., 30 July.
<i>Trogophloeus memnonius</i> , Er.	1 sp., 16 July.
<i>Staphylinidae</i> G. sp.	2 sp., 9 July and 30 August.
<i>Psyllobora 20-maculata</i>	2 sp., 2 August and 30 September.
<i>Laemophloeus biguttatus</i> , Say.	1 sp., 9 July.
<i>Cryptophagus</i> sp.	1 sp., 19 September.
<i>Cœnoscelis ferruginea</i> , Sahlb.	1 sp., 16 July.
<i>Tomarus</i> sp.	1 sp., 30 September.
<i>Epurea labilis</i> , Er.	7 sp., 6 June—19 July.
<i>Melanophthalmus distinguenda</i> , Com.	5 sp., 6 June—11 September.
<i>Scirtes tibialis</i> , Guer.	8 sp., 9 July—31 July.
<i>Cyphon variabilis</i> , Thunb.	14 sp., 9 July—30 September.
<i>Melanotus fissilis</i> , Say.	4 sp., 19 June—1 August.
<i>Athous Brightwelli</i> , Kirby.	1 sp., 19 July.
<i>Asaphes memnonius</i> , Hbst.	5 sp., 12 July—6 August.
<i>Thricus Chevrolati</i> , Bonv.	5 sp., 1 June—12 September.
<i>Podabrus</i> sp.	3 sp., 18 June.
<i>Podabrus</i> sp.	1 sp., 15 June.
<i>Hadrobregmus errans</i> , Melsh.	3 sp., 9 July—31 July.
<i>Nyctinus peltatus</i> , Harr.	2 sp., 16 July.
<i>Copris anaglypticus</i> , Say.	1 sp., 16 June.
<i>Aphodius ruricola</i> , Melsh.	6 sp., 21 June—31 July.
<i>Aphodius prodromus</i> , Brahm.	1 sp., 11 October.
<i>Serica vespertina</i> , Gyll.	3 sp., 6 June—18 July.
<i>Serica sericea</i> , Ill.	3 sp., 12 June—19 June.
<i>Diplo-taxis tristis</i> , Kirby.	1 sp., 14 May.
<i>Lachnosterna fusca</i> , Fröh.	1 sp., 7 June.
<i>Lachnosterna dubia</i> , Smith.	3 sp., 2 June—4 June.
<i>Orthosoma brunneum</i> , Forst.	1 sp., 5 August.
<i>Saperda calcarata</i> , Say.	1 sp., 31 July.
<i>Strongylium tenuicollis</i> , Say.	1 sp., 6 August.
<i>Hymenorus niger</i> , Melsh.	4 sp., 17 July—1 August.
<i>Hymenorus</i> sp.	1 sp., 6 August.
<i>Canifa pallipes</i> , Melsh.	5 sp., 6 June—18 July.
<i>Anthicus scabriceps</i> , Lec.	2 sp., 25 July.
<i>Otiorhynchus ovatus</i> , Linn.	5 sp., 19 July—29 August.
<i>Tomicus pini</i> , Say.	1 sp., 2 August.

ADDENDA.—The following Coleoptera have been kindly determined for me by Prof Wickham.

9923 <i>Cryptophagus acutangulus</i> , Gyll.	1 sp., 8 May.
<i>Cryptophagus laticlavus</i> , Casey	1 sp., 19 September.
<i>Atomaria</i> (very near) <i>oblongula</i> , Casey	1 sp., 30 September.
3986 <i>Ptilodactyla serricollis</i> , Say.	1 sp., 19 June.
4882 <i>Podabrus basillaris</i> , Say.	2 sp., 18 June.
<i>Podabrus basillaris</i> (var. <i>flavicollis</i>), Lec.	1 sp., 15 June.
<i>Hymenorus</i> sp.	1 sp., 6 August.

The species of Hymenoptera, Hemiptera and Diptera have not yet been determined, the first named number 24 species, the second 25 species, including 20 of Leaf-hoppers and the last (Diptera) 27 species.

SPINNING METHODS OF TELEA POLYPHEMUS.

BY J. W. COCKLE, KASLO, B. C.

After the publication of my letter on the above subject in the *Canadian Entomologist* of April last, I received several letters from correspondents bearing upon this subject, and in re-opening the discussion and adducing such data as I have been able to procure, I would touch upon reasons ascribed for the peculiarity displayed by the larvæ of this species in its different habitat.

In an article published by Mr. Wm. T. Davis, Journal of N. Y. Entomological Society, March, 1897, he gives as his reason for the suspension of the cocoon that it affords a protection from the attack of woodpeckers, and cites instances where he has found the contents of the pupa had been extracted through an opening made by these birds, and he thinks that the fact of allowing the cocoon to swing on the end of a twig affords great protection against attack from this source.

Another of my correspondents, Mr. F. M. Webster, also takes the same grounds as an explanation of this fact; to both of these querists I would suggest the consideration of the fact that larvæ of various sorts must, according to natural law, have been pre-existent to the woodpecker, and, whilst agreeing with them, that there are some grounds for their argument, I would seek a broader cause for the reason of suspension. The footnote of the Editor of *Canadian Entomologist*, in April, "that he had never seen a cocoon suspended as described and figured by the late Dr. Grote," confirms the observation of many eastern entomologists, and bears out the rule that dominates the habits of these larvæ in the east.

In order to have some practical demonstration of the habit of these larvæ I raised a small brood, and after they had passed the last moult they were liberated, without any restraint or protection, amongst a patch of brush, comprising a small birch (their food plant), a willow, and a *Ceanothus* with a good undergrowth of grasses and small evergreen shrubs.

28 larvæ were turned down, and in about four days they commenced to spin, occasional visits a few days apart for a further period of ten days found some of them still feeding, at the expiration of three weeks a search resulted in the discovery of twenty cocoons, the balance may be accounted for in having strayed off or being destroyed by birds; those recovered gave the following results:

Exhibit A. 3 cocoons. Found in grass under the food tree, encased in dried leaves, with the cocoon firmly attached to the ends of the grass stems which were bent and fastened with a lot of silk forming an arch, which would effectually keep the cocoon suspended off the ground when located under the protection of the overhanging boughs and brush. It will be noticed that some of the silk bands run down the grass stems for several inches.

Exhibit B. 14 cocoons. Firmly attached to the branch by a silken thong which is spun from the inside of the leaf along the leafstem, and thence extended completely round and along the branch.

Exhibit C. 1 cocoon. Silk spun up leaf stalk, but insecurely attached to branch, only two threads had been spun out to the normal distance, but the fact of the leafstem being completely surrounded with a casing of silk which extends up to the branch, shews an evident intention of securing it against falling.

Exhibit D. 2 cocoons. Spun between folded leaves without any apparent intention of securing them from falling.



FIG. 12. *Telea polyphemus* cocoon spun between leaves.

The results thus obtained show that out of twenty cocoons, eighteen had in some way made provision against falling to the ground, and, whilst an inspection of the cocoons sent will shew that many of them are so firmly attached to the branch that a woodpecker would find little trouble in piercing them, yet, the characteristic protection of the group would seem to point to some other cause than that assigned by my correspondents, and after having seen the result of my experiments to determine whether the suspension was accidental or premeditated. I can only reiterate my suggestion in *Canadian Entomologist* of April last, that this protection is mainly against climatic change, and their consequent destruction by wet, and is governed by the local climatic conditions.

Exhibit E. 1 Imago. Emerged 22nd August, another emerged two days later.

In conclusion, I would draw your attention to the paragraph dealing with this species by Dr. H. G. Dyar, Proc. National Mus. Vol. xxvii, 1,376, page 792, in which Dr. H. G. Dyar characterizes this moth as having a tendency to a distinctly local race, and in addition to the variation in colour mentioned by him it may be added that the submarginal band on the primaries is almost straight, and not curved as in the case of eastern and southern specimens, the wing being more angular than the falcate form of the eastern States, but at the same time not being sufficiently different to warrant a varietal name.

INSECT NAMES AND INSECT LISTS.

BY J. B. WILLIAMS, F.L.S., TORONTO.

Some time ago the British Museum received a pair of giraffe skins from East Africa. They were mounted for the museum, and it became necessary to identify the exact variety of giraffe to which they belonged, so Dr. Lydekker wrote a paper revising the species and subspecies of giraffe all over Africa, "and without," he says, "any desire to add to the burden of zoological nomenclature," he came to the conclusion that the right scientific name of these museum specimens was *Giraffa camelopardalis Rothschildi*; or the "Baringo Giraffe."

It is all very well for a great creature of this kind to have a long name, but there is a quiet, harmless, little brown bird with a yellow spot over the eye, and on the bend of the wing, that builds its nest every summer among the grasses of our fields and meadows; and if you wish to speak of it scientifically you must call it *Ammodramus Sandwichensis savanna*; I allude to the Savanna Sparrow.

And worse, still, a western form of the little common blue butterfly is labelled *Lycæna pseudargiolus Arizonensis*. What has the little creature done to deserve such an awful title? These titles have 30 or 32 letters in them; some names of the small moths are even worse, and have 36 or 37 letters.

It is necessary to have some means of designating well defined varieties or subspecies, but the present method of adding a third word just like another specific name is awkward, and cumbersome; and, I may add, unscientific, for it uses as long a word to define small and unimportant differences as it does to indicate great and important ones. A number of names are thus occupied that might otherwise be employed for genera and species, and this is a serious thing, for species are now so numerous that suitable words of Greek or Latin origin that have not previously been used, are very hard to find. Mr. Taylor complains of this difficulty in the *Canadian Entomologist* for last month; and every year the difficulty increases.

The plan of naming varieties after the discoverer or his friends is one way of getting over the difficulty, but it is in many ways a very objectionable method. Some people like to see their names cut on the trunks of trees, or deeply engraven on the benches of a public park; but entomologists have a weakness for tacking them on to the title of some poor little bug or butterfly, and, possibly, the hope of being thus immortalized sometimes gives additional incentive to their zeal for uselessly multiplying subspecies and varieties, and thus piling up outlandish names that make, not only amateurs, but also many professional naturalists complain of the grievous heaviness of the burden.

Is there no possible relief from such a system? A great number of subspecies are merely geographical races, and might always be designated as Northern, Southern, Eastern or Western forms. For all these the first three letters of the Latin words—*borealis*, *australis*, *orientalis* and *occidentalis* might be affixed after the specific name; this would give us *bor.*, *aus.*, *ori.* and *occ.* as the mark of such varieties. In the same way Spring, Summer, Autumn or Winter forms could be designated by *ver.*, *æst.*, *aut.* and *hib.*, respectively, and, as every one interested would soon know what such signs stood for, it would never be necessary to write the words in full. For certain varieties that could not be described by these marks a few others would, perhaps, be necessary. Differences in color, such as pale or dark forms, could be designated by *obs.* and *pal.*, or differences in pattern, such as streaked or spotted, could be shown by *lin.* or *mac.*, or where it was desirable to distinguish differences in size, such as small, middle sized, and large, *parvus*, *medius*, and *magnus* could be shown by *par.*, *med.* and *mag.*, and *typ.* could be affixed to the species that was regarded as the typical form. Thus fourteen or fifteen marks of this kind would suffice for nearly all existing varieties, not only of insects, but also, probably, of birds and mammals, and even if they had to be increased to twenty-four, or twenty-five, there would be no great difficulty in remembering that number. Dr. Fletcher's little *Thecla* would become *Thecla strigosa occ.*, and the two forms of *G. comma* would be *G. comma æst.*, and *G. comma aut.* This would be a shorter and more compact method than the present one, and as

the signs do not spell real words they could not be mistaken for anything else.

There would then be a marked difference between the specific and sub-specific designations, and the one that marks only slight variations would not appear very important, nor could it be used alone, but only in connection with the specific name. The dislike of trinomials has led some naturalists to maintain certain forms as species, which ought to have only sub-specific rank; if some short and simple method, such as this, were in use these species would soon be relegated to their right position, and the number of species be materially reduced. There has been, sometimes, almost a craze for the discovery of new species, and to gratify it small and unimportant differences have been unduly magnified.

There is an amusing and satirical passage in one of Mr. Ruskin's lectures to the students at Oxford, which we would still do well to bear in mind when we are tempted to devote too much time and energy to the detecting of slight differences. He was speaking of birds, but the same principle applies to all branches of zoology. "None of you," he says, "could have much hope of shooting a bird in England which would be strange to any master of the science, or of shooting one anywhere which would not fall under some species already described. And although at the risk of life, and by the devotion of many years to observation, some of you might hope to bring home to our museum a titmouse with a spot on its tail which had never before been seen. I strongly advise you not to allow your studies to be disturbed by so dazzling a hope, nor your life exclusively devoted even to so important an object."

This Society has, I believe, officially recommended its members to adopt the nomenclature of Dyar's List of the Lepidoptera; but for identifying species, I suppose many of us find Holland's books much more helpful and useful, on account of the splendid illustrations, but to get Holland's names, and then try to identify them with those in Dyar's List, is a work that has a tendency, at times, to nearly drive one frantic.

Then for general reference, when you want to see at a glance the position and relationship of the different genera, a condensed list like J. B. Smith's is very much more convenient than a voluminous one like Dyar's, and, as he is very conservative of the old names, its use does not necessitate the entire relabelling of a collection. Even Holland has left the old paths in his arrangement of the Sphingidæ, and has followed the revolutionary scheme of Rothschild and Jordan; though after preparing his plates for the old way, it seems a pity to have changed the letter press at the last moment; indeed, the opposition in order of the plates and the letter press causes a good deal of irritation to the reader.

All this confusion, of course, arises very largely from a persistent application, without any discrimination or consideration of the great *Law of Priority*, which, like other good things, is good in moderation, and tends to secure a fixed and permanent nomenclature, but carried to an extreme it defeats its own ends, and often produces an opposite result. If, whenever any obscure old author is found to have suggested a name for a species, which, perhaps, no one else ever adopted, a few days even before the usually accepted name came into use, everything must be changed to carry out the Law of Priority to its bitter end; why the Law becomes a curse instead of a blessing. There are many instances just like this where for seventy or eighty years every writer has used a certain name, but because some old fogey, two or three years before, suggested something else, the time honored and familiar appellation is all swept away, and confusion and irritation reign in its place.

It is very well to apply such a law to recent names, or where several titles have been equally in use for some time, but to make it binding in every instance, seems absurd, and is a method that we should never think of adopting in the ordinary affairs of life. Mr. Lyman suggested in his presidential address, a few years ago, the formation of an Entomologists' Union, that should bring out an authoritative Insect List; there are, I suppose, many difficulties in the way of such an undertaking. It would, however, be a great convenience if we had a list of Canadian Lepidoptera—a work which this Society might very well undertake—so that beginners would not have to wade through page after page of irrelevant matter when seeking information about our own species.

It might be formed on the general plan of Dyar's List, and, according to his nomenclature, if that was thought desirable, but the old names of genera should be placed in brackets beside the new ones where changes have been made, and the geographical range of each species, and time of appearing, given as far as possible.

The Montreal branch had, at one time, something of this kind in view, and prepared some material for it, I believe. And if some method of indicating subspecies, as here proposed, could be adopted in such a publication, it would recommend itself to many, I think, as a partial deliverance from the grievous burden of scientific nomenclature.

NOTES ON THE SEASON OF 1904, (WESTERN QUEBEC).

BY CHARLES STEVENSON, MONTREAL, QUE.

The agriculturists of this district have been little troubled by insect pests. The potato beetle, *Leptinstarsa* (*Doryphora*) *decemlineata* Say, has not been troublesome. The Tent caterpillars *Malacosoma Americana*, Hub, and the Tentles *M. distria*, Hub., have been scarce. Some colonies of the former were seen at St. Hilaire, which had practically destroyed some young and isolated apple-trees, but there were no signs of attack on the old trees, thanks to the excellent care taken of the orchards and the application of insecticides. The common Tussock-moth caterpillars *Hemerocampa leucostigma*, S. and A., continue to increase on the shade trees of Montreal and throughout the district. The caterpillars of *H. defnita*, Pack, were more prominent this year.

The *Rhopalocera* usually found in this district were more abundant than last year, except *Anosia plexippus*, Linn, which still remains conspicuous by its scarcity. *Enodia portlandia*, Fab., has been taken several times on Montreal Island in the month of August.

The flight of *Heterocera* was more interesting in the numerous species found in comparison to the quantity of specimens on the wing, thus making collecting at light more enjoyable. The most attractive catch was, probably, that of a specimen of *Erebus odora*, Linn, on the 13th September on Cadieux Street, Montreal. That beautiful moth *Euclea delphinii*, Bois, was taken on the 18th July, and the attractive geometer *Euchlaena serrata* Drury, on the 11th May. *Tolyte velleda*, Stoll, was very abundant at light from the 14th to 16th September, and there was a veritable plague of *Ennomos magnarius*, Gn., in all varieties of markings on the 26th September, with practically nothing else flying.

The collectors of Coleoptera have worked hard this season, and obtained good results. A patch of Elder bushes *Sambucus Canadensis*, Linn, at Cote St. Paul were swarming with our beautiful longhorn beetle, *Desmocerus*

*palliatu*s, Forst., during the second week of July. Six specimens of *Obrium rubrum*, Newm., were taken on the Boucherville Islands on the 25th July. *Cicindela scutellaris* var. *rugifrons*, Dej., was taken near Longueuil on the 3rd August. This is an interesting capture, as it has not been previously reported north of Massachusetts. Other interesting captures were:

Thermonectes basilaris, Harr, Montreal, 16 July.

Buprestis femorata, Fab, Montreal, 9 July.

Leptura nitens, Forst, Longueuil, 24 July.

Hoplosia nubila Lec., at light, Montreal, 18 July.

Graphisurus fasciatus, DeG., Montreal, 8 June.

Donacia pubescens, Lec., St. Hilaire, 1 July.

Chrysomela pnisra, Stol, St. Hilaire, 24 July.

Nacerdes melanura Linn. This is an introduced species, and was extremely common about the wharfs and warehouses of Montreal during June and July. A few specimens were also found on the sidewalks uptown and in Longueuil.

Aphodius erraticus Linn. Another European beetle, two specimens were found for the first time in Canada at Maplewood, near Montreal, by Master K. R. Stevenson, on the 1st May. (*Can. Ent.* xxxvi. 164).

In the *Diptera*, the most interesting capture was two specimens of *Pterodontia flavipes* Gray, a large fly with a very small head, on the Boucherville Islands 25 July.

In the *Orthoptera*, two specimens of *Panchlora viridis* Burm, of the Blattidae or "Roaches" were captured, evidently introduced in some cargo of fruit.

INSECTS AFFECTING THE OAK.*

BY THE REV. THOMAS W. FYLES, D.C.L., F.L.S.

The oak is one of the lords of the forest. It is a stately, handsome and long-lived tree. Its wide-spreading branches make a grateful shade; its rich foliage is pleasant to the eye; its timber is valuable for a variety of purposes. In former days it was more largely used than it is now. The "wooden walls of old England," the mighty "three-deckers," were built of it. The forest of Dean in Gloucestershire supplied the trees. It was used also for the frames and wainscoting of houses; and oak furniture was highly prized.

The oak is not a common tree in the neighborhood of Quebec; and in the eastern townships it is seldom met with; but in Ontario it is more frequently seen.

Unfortunately, this handsome tree is much troubled with insect pests—perhaps more so than all our other hardwood trees put together.

Many an interesting and instructive volume might be written on the oak tree, and its inhabitants. In a paper, such as I have to read to you, I can only tell of some of the most remarkable of the frequenters of the oak.

*Read before the Quebec branch of the Ent. Soc. of Ont.

First, then, there is the broad-necked Sawyer, (*Prionus laticollis*, Dru). Fig. 13. I have not met with this in Quebec, but I have seen a specimen that was taken near Sherbrooke. This fine beetle is two inches long, and broad in proportion. Its larva feeds on the roots of the tree.

Boring in the trunk is the carpenter worm—the larva of the fine moth *Prionoxystus robiniae*, Peck. This caterpillar is nearly three inches long. It has a livid, reddish body, and a glossy black head. It makes a tunnel as large as the bore of a half-inch auger. When nearing perfection it works its way to the surface of the wood, and prepares a way of exit for the future moth. It then retires about three inches, and spins a cocoon, in which it undergoes the pupal change. In due time the pupa breaks from its cocoon, works its way to the opening made by the caterpillar, and allows the moth to escape. The moth appears in June and July. This species tunnels in the locust tree (*Robinia pseudacacia*, L.) as well as in the oak, and from this it derives its specific name, *robiniae*.

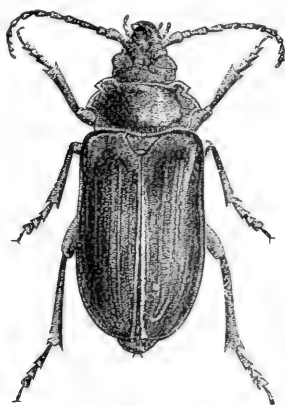


FIG. 13.

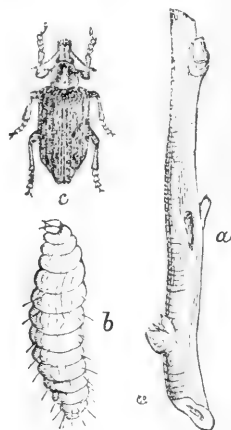


FIG. 14.

Mr. Albert F. Winn, of Westmount, P. Que., has found upon oak trees on Mount Royal specimens of the fine moth, *Prionoxystus Macmurtrei* Guerin-Méneville. The larva of this species is known as "The Lesser Oak Carpenter Worm."

A great variety of beetle-grubs are miners in the oak, and are very injurious to it, *Buprestidæ*, *Curculionidæ*, *Cerambycidæ*, *Scolytidæ*, etc.

The specimen I exhibit is *Urographis fasciatus*, De Geer, one of the *Cerambycidæ*. The species to which it belongs is found throughout the United States and Canada. Notice the long ovipositor of the female insect. With this she pierces the outer layers of the bark of the oak, that she may deposit her eggs in the softer layers within.

The larvæ tunnel in the bark close to the white wood, and pack their passageways so full of fine frass that it is hard to trace them. The beetles appear early in June. The larvæ and pupæ should be looked for early in the spring.

It may have been to this beetle that the damage we noticed to the oaks in the grounds of Mr. Wade at New Liverpool, two or three years ago, was due.

Another injurious beetle is *Ithycerus noveboracensis*, Forster. This is the largest of our weevils or curculios. (Fig. 14c.). The female gnaws a small opening in a branch of the oak, (Fig. 14a), and then deposits an egg in it. The larva (Fig. 14b.) burrows in the twigs.

Among the interesting things that affect the oak are the *Cynipidæ*. You will remember that on one of our field days we visited the country-house of our friends, Mr. and Mrs. Morgan, on the Island of Orleans; and that our attention was drawn to the woolly galls upon the oak trees around it, and to the curious beetles, *Balaninus rectus*, Say, that we shook in such numbers from the branches.

Galls of the kind mentioned are formed by the four-winged fly, *Callirhytis seminator*, Harris. They are polythalamous, each being made up of distinct cells with flocculent matter attached. The flies that come from them differ in the sexes. The males are shining black, with tawny yellow legs and antennæ; the females have the head and thorax cinnamon red.

A remarkable gall that I have found on oaks, near Montreal, is that of *Amphibolips inanis*, O. S. It is produced on the red oak, and comes to maturity in June. When opened at this time it is found to consist of a mere shell with a central chamber, held in place by radiating filaments. The fly makes its way from this central chamber, bites a round hole in the outer rind, and so escapes.

A variety of larvæ, both of moths and butterflies, feed upon the leaves of the oak. The most injurious of these is the Forest Tent-caterpillar, the larva of *Clisiocampa disstria*, Hbn., (Fig. 15.,) which spins a cob-web like



FIG. 15. Forest Tent-caterpillar.

nest against the sides of the tree, and swarms along the branches, stripping them of their foliage.

This caterpillar must not be confounded with that of the *Clisiocampa Americana*, Fabr., of the orchard. It differs from it in several respects. One of these is easily remembered. The larva of *C. disstria* has a row of white spots along the back, that of *C. Americana* has a white stripe.

The largest larvæ that sometimes feed on the oak are those of the handsome Saturnian, *Attacus Cecropia*, Lin, and the no less handsome *Telea Polyphemus*, Cram., beautiful larvæ feeding on the oak, and well worthy of observation are those of:

Anisota pellucida, Hubner.

Halisidota tessellaris, A. and S.

Halisidota maculata, Harr.

Edema albifrons, A. and S.

Several kinds of oak-feeding larvæ are stingers:

Hemileuca maia, Drury.

Lagoa crispata, Pack.

Phobetron pithecium, A. and S.

Sibine stimulea, Clem.

Of these the only one I have found at Quebec is *Phobetron pithecium*, the 8-flapped slug-worm.

Of butterfly larvæ that are found on the oak, these may be mentioned:

Limenitis disippus, Godt.

Thecla calanus, Hbn.

Nisoniades brizo Bois., Lec., and occasionally *Papilio turnus*, Linn. These are all found in the neighborhood of Quebec.

With brief accounts of two diminutive moths that frequent the oak I must bring this paper to a close.

A few seasons ago I found on the oaks growing on the Rhodes estate at Bergerville great numbers of the caterpillars of the beautiful little Tortrix, *Cacæcia ferridana*, Clem. The caterpillar of this species is brownish buff, and has a dark brown head. When disturbed it lets itself down by a thread, dangling at the end of it spider-wise. It gathers several leaves together and binds them with silken threads. Within the nest so formed it makes itself a silken case—feeding from it upon the pulpy portions of the leaves. And in this case it undergoes the change to the chrysalis.

The moth is a pretty little object with reddish brown fore-wings, much clouded with fuscous and marked with several brown patches. The hind wings are very dark. The fringes are pale.

The other moth—the last I shall mention—is a miner, *Lithocolletes hamadryadella*, Clem. Its larva forms whitish blotches in the leaves, for it feeds between the upper and lower skins of the leaf. Sometimes four or five of these blotches will be found in one leaf. The tiny caterpillar is brownish yellow, flat, footless, but very active. When full fed it goes into chrysalis within its mine. The moth is a brilliant little object with white fore-wings, having bronze bands with black borders on the inner side. The hind wings are silvery. It is one of the numberless minute things in nature that glorify God by bearing witness before men of His almighty power.

ON THE FOOD HABITS OF CERTAIN OF THE HYMENOPTERA.

(Paper No. II.).

BY REV. THOMAS W. FYLES, D.C.L., F.L.S., LEVIS, QUEBEC.

GALL-INHABITING HYMENOPTERA.

Galls are abnormal growths upon various parts of plants, resulting from the operations of insects of different kinds, every kind of insect agent producing its own peculiar gall. But here it must be observed that the insects found in galls are not, in all cases, the producers of them; they may be intruders, either hurtful or harmless, upon the domains of others.

The insects belonging to the Hymenoptera that are found in galls may thus be grouped:

A—Gall producers.

a—Solitary.

b—Social.

B—Gall invaders.

a—Feeding upon the substance of the gall.

b—Preying upon the producers of the gall, or their guests.

A, a—Of galls produced by Hymenopterous insects, the kind found upon the leaves of the White Willow (*Salix alba*, L.) is so abundant and conspicuous that even the least observant dweller in the country, having a knowledge of the tree and the use of his eyes, will readily call the galls to mind. They are produced by a small Saw-fly.

The White Willow is not indigenous to this country; it was introduced from Europe, and the saw-fly was, probably, introduced with it. In 1885 I submitted specimens of our Canadian insect and its galls to Mr. Edward

A. Fitch, of Maldon, England, and he wrote, "The saw-fly I have but little doubt is identical with our British *Nematus gallicola*, Westw. (*vallisnerii*, Hart.) as far as I can judge from the female and gall sent."

The female insect makes a slight wound in the leaf, and then deposits an egg in the wound. It may repeat the process a number of times on the same leaf. Around the egg the gall begins to form, and it soon becomes a stronghold and storehouse for the larva that is hatched from the egg.

What a strange existence is led by this larva! It is unacquainted with its kind; it knows nothing of its future; it abides in its "assigned and native dwelling place." Its sole occupation is eating away the walls of its cell, as they thicken around it, and making room for its own growth. It obeys a blind instinct; and so it spends the summer. In the autumn it is carried in the leaf to the ground, or, if the leaves be unusually persistent, it bites its way out of the gall and drops to the ground. In either case, having vacated its cell, it creeps into the soil, and there spins itself a close, brown cocoon of the size of a grain of wheat, and in this it abides, changing to a pupa about the close of the winter. In spring the perfect flies appear.

At one period of its existence this insect is liable to the attacks of a very formidable foe, the house sparrow.

From my study window I can see three large willows standing in my yard, and several times, at the close of summer, I have observed flocks of sparrows busily engaged in cracking the *Nematus* galls with their bills, and picking out the larvæ.

I do not think this *Nematus* does any harm to the tree, and the kidney-shaped, rosy-tinted galls are, rather than not, an embellishment to the leaves.

A, b, The Bedeguar of the Rose, or, as the children in England call it, Poor Robin's Pincushion, affords an example of a gall community. It is formed by a cynipid, *Rhodites rosæ*, L. It consists of a number of cells closely united and tufted with numerous branched filaments, which serve the inhabitants of the galls as a protection from the winter's cold, and also, it may be, against the attacks of feathered enemies.

I do not find this gall around Quebec; but, some years ago, I found a number of them upon wild rose bushes growing in a pasture at the foot of Yamaska Mountain, on a farm that belonged to the late Rev. Canon Robinson; and I was able to raise the gall-fly from them in considerable numbers.

Another interesting example of these polythalamous galls is that of *Callirhytis seminator*, Harris. This pretty insect lays its eggs in the wounds it makes around the twigs of the white oak. The galls develop into a flocculent mass, imbedded in which the larval cells may be found. The perfect insects appear in the end of July. Galls of this kind are, in some seasons, abundant on the Island of Orleans.

B, a, I have often found upon the Canadian Blueberry (*Vaccinium Canadense*, Kalm), a very pretty gall of the size of a cherry, and of a rosy hue. The maker of this, *Solenozopheria vaccinii* was described by Mr. Ashmead in 1887 (Trans. Am. Ent. Soc. XIV., p. 149). I have never raised it; but I have obtained from the galls a species of guest-fly, *Megarismus nubilipennis*, Ashmead, in considerable numbers. A cross cut of a gall will shew the cells of this parasite in orderly arrangement. The

larvæ found in the cells are white and plump, and waxen in appearance, and have sharp mandibles. They are liable to attacks from predaceous secondary parasites. (Fig. 16).

B, b. There is a two-winged fly (*Trypeta solidaginis*, Fitch), which forms a large, round, pithy gall in the stems of the Golden Rod (*Solidago Canadensis*, L.). The larva has its cell in the centre of the gall, but bites



FIG. 16. a. Gall on Blueberry. Natural size. b. Section of Gall, showing cells of Guest-fly. Natural size. c. Larva of Guest-fly. Greatly enlarged.

a passage to the outer rind. Through this passage, probably, an insidious foe finds its way, viz., *Eurytoma gigantea*, Walsh. I gave a minute description of this species, both of the male and of the female, in the *Canadian Entomologist*, vol. xxvi., p. 122.

The country naturalist, who takes the trouble to study the plant galls and their inhabitants, finds many things to awaken his interest and to excite his admiration.

AN ELEMENTARY STUDY OF INSECTS.

By PROF. W. LOCHHEAD, GUELPH.

The late Prof. C. V. Riley, of Washington, estimated the number of kinds of insects on the earth at ten millions. Of this immense number only 200,000 are known, yet these make up two-thirds of all the kinds of animals known. The question will naturally arise: In what way do insects differ from other animals? Although they differ much among themselves, all in-

sects are seen to have much in common when their structure is studied. They all have, when full grown, three pairs of jointed legs; their bodies are composed of rings, or segments, more or less closely joined together into three re-

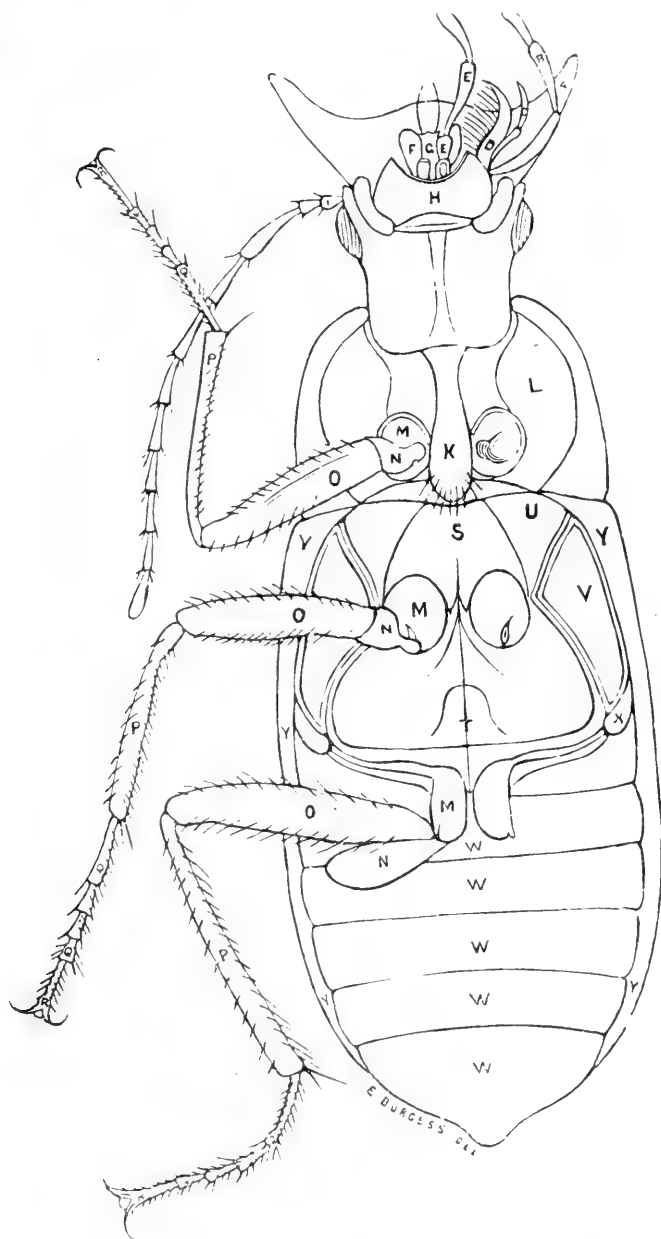


FIG. 17. Diagram of the underside of a Beetle (*Harpalus Caliginosus*); A. Mandible; B. Maxillary palpus; C. outer tube of Maxilla; D. inner tube of Maxilla; E. labial palpus; F. paraglossæ; G. Ligula; H. mentum; I. antenna; K. prothorax; L. episternum of prothorax; M. coxæ; N. trochanter; O. femur; P. tibia; Q. tarsus; R. claws (ungues); S. mesosternum; T. metasternum; U. episternum of mesothorax; V. episternum of metathorax; W. ventral segments; X. epimeron of mesothorax; Y. epipleuron.

gions, head, thorax, and abdomen; they breathe air; they have one pair of feelers, or antennae; and usually one or two pairs of wings. By these characters, insects are readily distinguished from true worms, or from spiders, centipedes, and cray-fish, their near relatives.

The Head. The head bears the feelers or antennae, the eyes, and the mouth-parts, and is concerned with the *sensation of touch* and the *getting of food*.

The *feelers* function as organs of touch and perhaps of taste, and are very varied in shape. The *eyes* are compound and are composed of a large number of simple eyes. The *mouth-parts* are very unlike in different insects. In those insects which feed by chewing or biting their food, there are an upper lip, the *labrum*; a pair of jaws, the *mandibles*, which work sideways; a pair of smaller jaws, with feelers, the *maxillæ*; and a lower lip, the *labium* (Fig. 17). In those which take up fluid food, the mouth-parts are modified for sucking (Fig. 18), licking or piercing (Fig. 19). To combat injurious

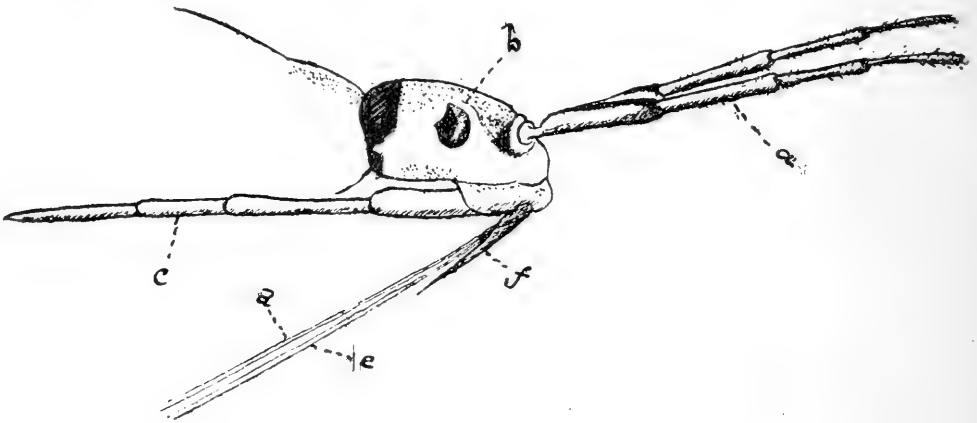


FIG. 19. Head of a sucking insect (Squash bug); *a* antennæ; *b* the eye; *c* the 4-jointed beak; *d* and *e* the four lances; *f* the labrum, (original).

insects successfully, the farmer or gardener should be able to tell biting forms from sucking forms, for it is possible to poison the food of the former, but not that of the latter.

The Thorax. The thorax is composed of three united segments. The first bears a pair of legs, while the second and third bear not only a pair of legs, but also often a pair of wings. It is clear that this region of the body is concerned with *movement*. (Fig. 20).

The legs of insects are jointed, and are composed of the following parts: The *coxa*, or hip; the *trochanter*; the *femur*, or thigh; the *tibia*, or shank; and the *tarsus*, a three to five jointed foot ending in claws. (Fig. 17).

The Abdomen. The abdomen is composed of many segments without limbs in adults; but in the young state, some insects, such as, butterflies, moths, saw-flies, there are *unjointed* feet, or *pro-legs*, on the abdomen. (Fig. 21). The organs of reproduction and digestion are situated within the abdomen.

The *alimentary canal* occupies the middle portion of the body, and is composed of *gullet*, *crop*, *gizzard*, *stomach*, and *intestine*. The crop may be called the storing stomach, and the gizzard the grinding stomach. Digestion takes place in the true stomach, into which the coecal tubes empty their secretions. With most sucking insects, however, the gizzard is wanting.

The *nervous system* lies below the alimentary canal, and close to the lower body wall. It is composed of a series of *ganglia* connected by two long, slender cords. The ganglia in the head is the largest, and supplies nerves to the eyes, feelers, and mouth. In general, each segment of the body has a ganglion which sends off nerves in all directions, to supply the segment.

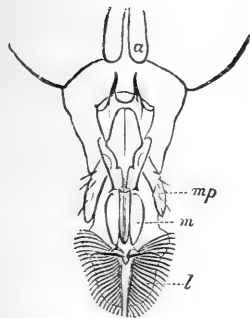


FIG. 18. Mouth parts of a House-fly.

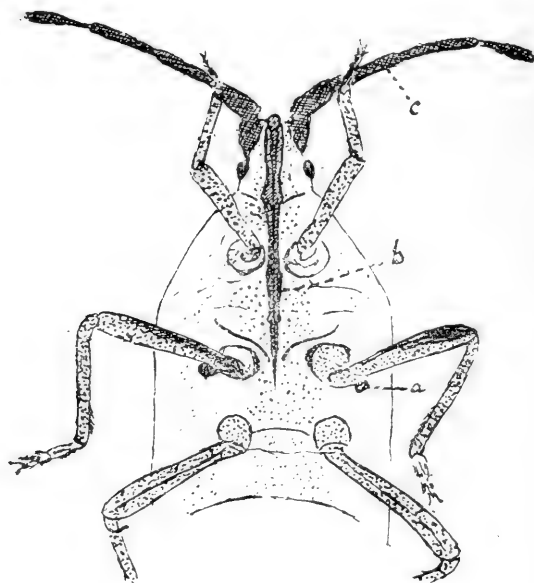


FIG. 20. Under surface of Head and Thorax of a Squash bug; *a* the odour glands; *b* the sucking beak; *c* the antennae. (Original).

The *respiratory system* is clearly shown in Fig. 22. The breathing-pores, or *spiracles*, are valve-like openings lying along each side, and open almost directly into a tube which runs lengthwise of the body. From these

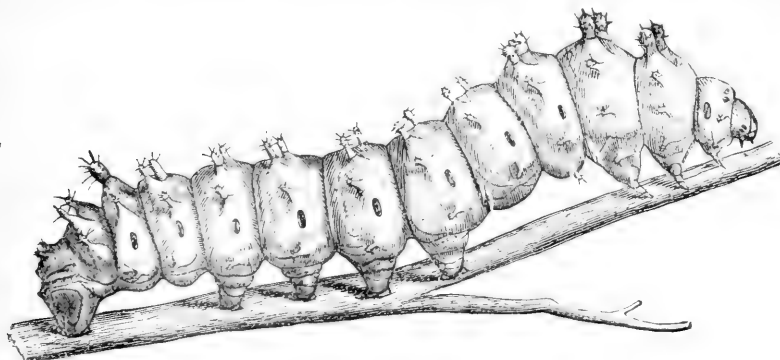


FIG. 21. Caterpillar showing pro-legs as well as feet.

two main tubes branches run in all directions through the body to the main organs. In many insects there are bulb-like expansions which act as air-reservoirs. By means of the system of tubes, or *tracheæ*, air is carried to all portions of the body, and the blood is rapidly purified by exchanging carbon-

dioxide for oxygen. In the case of sucking insects, the most effective way of killing them is to suffocate them by clogging the spiracles with such substances as tobacco, soap solution, kerosene emulsion, insect powder, lime, or dust.

The *blood*, which is nearly colorless, flows free within the cavity of the body, and bathes the various organs. The requisite amount of oxygen is obtained by exchange from the tracheæ which contain air.

REPRODUCTION AND METAMORPHOSIS. Most insects lay eggs, but a few bring forth living young. As a rule, insects have great powers of reproduction, but seldom are the newly hatched insects exactly like the adults. In

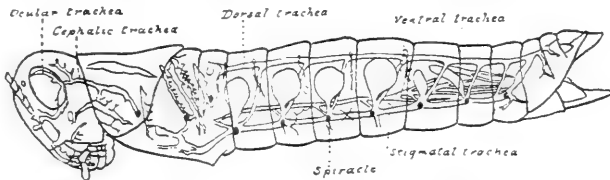


FIG. 22. Respiratory system of Grasshopper (after Hyatt).

fact, most insects pass through a more or less marked change during their lives. This is known as *Metamorphosis*, which is said to be *complete* (Fig. 23), when the insect passes through a stage of almost total rest, takes no food, and moves but little; and *incomplete* (Fig 24), when the insect does not pass through a stage of rest, but feeds and changes its form gradually with every moult, becoming more and more like the adult. As insects grow they cast off their old skin at intervals. The new skin is soft and elastic, but as it gets older, it becomes hard and inelastic. This is stripped off and replaced

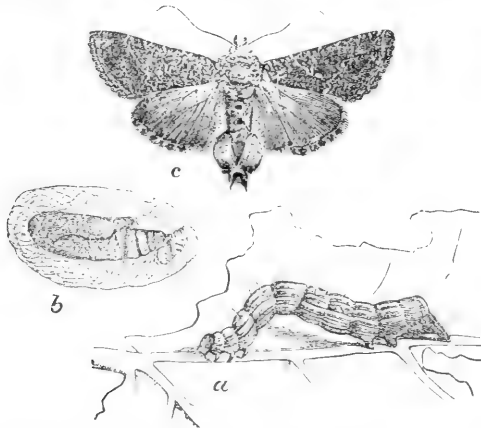


FIG. 23. Complete metamorphosis; *a* caterpillar; *b* chrysalis in a cocoon; *c* moth.

by a new one. By this *moulting*, growth is not interfered with. Among these insects which undergo complete metamorphosis are: Butterflies, moths, beetles, bees and wasps and flies. The different stages are known as *egg*, *larva*, *pupa*, and *adult*. The larval stage of insects is the most important one from an economic standpoint, for it is the feeding stage, and it is then that vegetation is injured. The larvæ of butterflies and moths are known as *caterpillars* (Fig. 21), and have usually 8 pairs of legs, sometimes only 5 pairs; those of saw-flies have usually 10 pairs of legs.

Grubs are the larvæ of beetles (Fig. 25), and have commonly only three pairs of legs. *Maggots* are the larvæ of flies (Fig. 26), bees and wasps, and are footless.

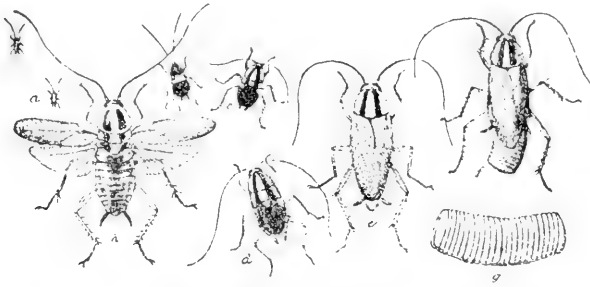


FIG. 24. Incomplete metamorphosis of a Cockroach; a, b, c, d, young larvæ; e, f, h, winged adults; g eggmass, magnified.

The grasshoppers, crickets, and bugs (Fig 27), undergo incomplete metamorphosis, so that the young resembles the adult, and becomes more like the adult with each succeeding moult.



FIG. 25. Grub of beetle.

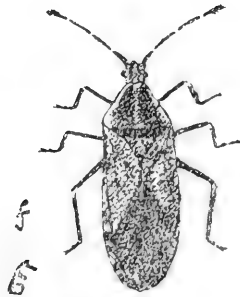
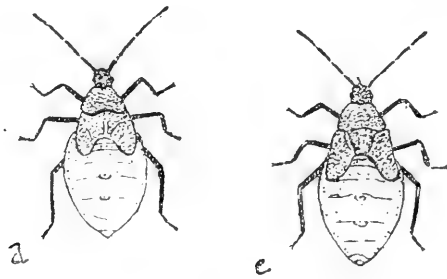
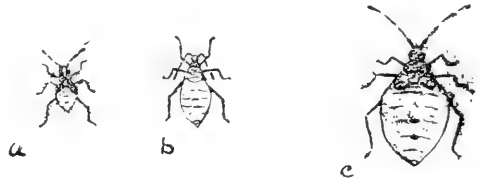


FIG. 27. Development of a Squash-bug from a young individual to an adult.

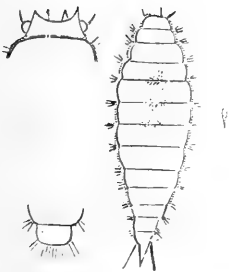


FIG. 26. Maggot of a Wheat midge.

Although the pupa stage is inactive, nevertheless it breathes slightly, and uses up some of the food which is stored in the body as *fat-bodies* during the larval stage. Some pupæ are naked (Fig. 28), and others are surrounded by a *cocoon* (Fig. 29), or web, which is spun by the larva. All pupæ, however, are invested in a more or less tight-fitting case. With some, the case covers the body loosely, but in others, the outlines of every external structure are clearly shown.

LIFE HISTORY: The life-history of an insect means simply the *life story*, that is, "all the changes it goes through, and all that it does from the time it hatches from the egg, or is born, until it dies of old age." It becomes an important matter to learn the whole life story when we wish to combat injurious insects, for very frequently there is a stage (not always the same stage for all insects), when they are most easily attacked and destroyed.



FIG. 28. Pupa of an *Archippus* butterfly.

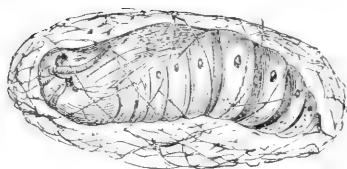


FIG. 29. Pupa in a cocoon.

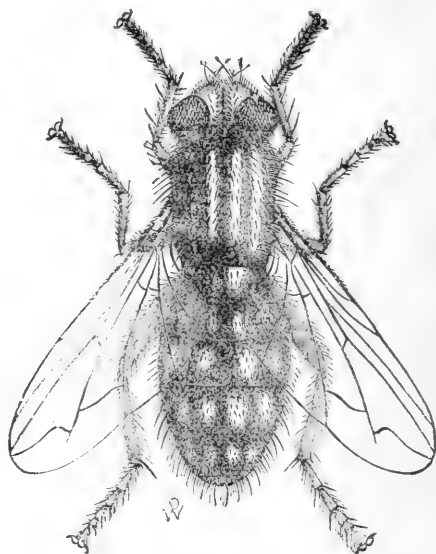


FIG. 30. Two-winged fly (*Diptera*).

CLASSIFICATION OF INSECTS. Insects are, for convenience of study, divided into *Orders*, named according to the nature and number of the wings. Only seven orders will be discussed here, as nearly every insect of economic importance belongs to one of the seven:

1. With two wings *Diptera*. (Fig. 30).
2. With four wings:
 - A. Upper and lower wings similar in texture.
 - a. All wings scaly..... *Lepidoptera*. (Fig. 31, 32).
 - b. All wings naked or a little hairy:
 - (1) Wings many veined *Neuroptera*. (Fig. 33).
 - (2) Wings few veined *Hymenoptera*. (Fig. 34)
 - B. Upper and lower wings unlike in texture.
 - (a) Mouth-parts formed for sucking... *Hemiptera*, *Heteroptera*, (Figs. 19 and 20).

- (b) Mouth-parts formed for biting :
- (1) Upper wings horny.....*Coleoptera*. (Fig. 35).
- (2) Upper wings parchment-like ...*Orthoptera*. Fig. 36).

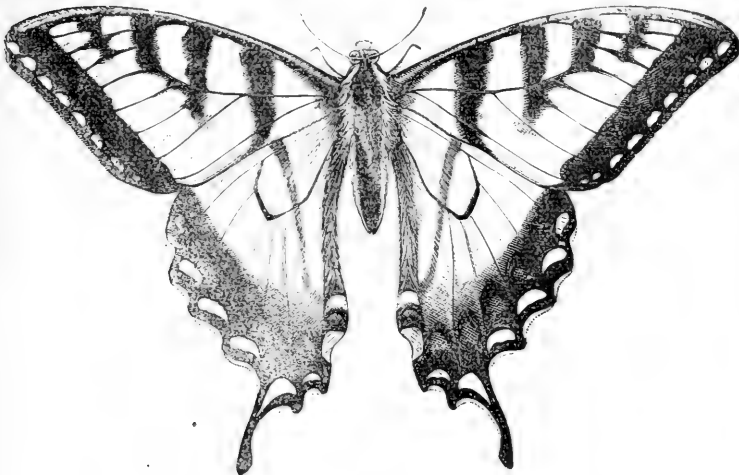


Fig. 31. Butterfly (Lepidoptera)

When both the mouth-parts and the wings are used for classification the following may be used :

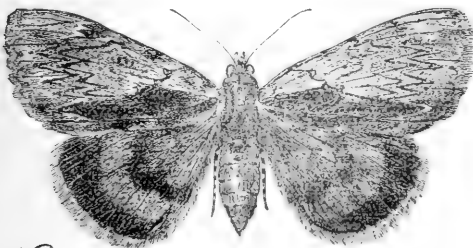


Fig. 32. Moth (Lepidoptera)

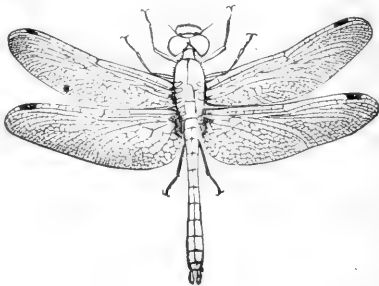


Fig. 33. Dragon-fly (Neuroptera)

1. Insects with both a biting and sucking mouth and wings with but few veins..... *Hymenoptera*.



Fig. 34. Wasp (Hymenoptera)

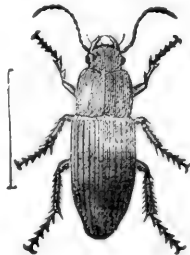


Fig. 35. Beetle (Coleoptera)

2. Insects with a biting mouth :
- A. Upper wings horny..... *Coleoptera*.

- B. Upper wings parchment-like *Orthoptera*.
- C. Upper wings with many veins..... *Neuroptera*.
- 3. Insects with a sucking mouth:
 - A. All wings scaly *Lepidoptera*.
 - B. Only two wings..... *Diptera*.
 - C. Upper wings half leathery and half membranous

The Hymenoptera contain many beneficial forms, and some injurious forms. The metamorphosis is complete. They are often divided into the *stinging* species, such as bees, wasps, digger-wasps, ants, etc.; and the *piercing* species, such as Ichneumon flies (Fig. 39), Chalcid-flies, Gall-flies, Saw-flies (Fig. 40), and Horn-tails.

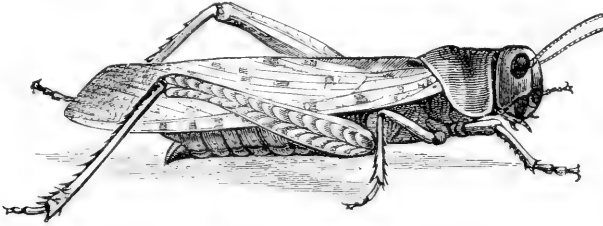


Fig. 36. Grasshopper (*Orthoptera*)

The *Colcoptera* or the *Beetles* are divided into the *True Beetles*, and the *Snout Beetles*. The True Beetles are again divided according to their *tarsi* and *antennæ* into:—

1. *Carnivorous* beetles with thread-like antennæ, and nearly all are beneficial. Such are the Tiger-beetles (Fig. 41), and the Ground-beetles.



Fig. 37. a. Bug
(*Hemiptera*
Heteroptera)

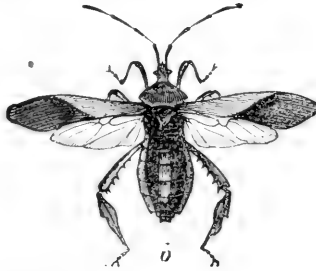


Fig. 38. Bug with wings
expanded (*Hemiptera*)



Fig. 39. Ichneumon Fly
(*Hymenoptera*)

2. *Club-horn* beetles with club-shaped antennæ. Most of these are beneficial. Among these are Rove-beetles, Burying-beetles, and Lady-bird beetles (Fig. 42).

3. *Saw-horn* beetles with saw-toothed antennæ. These are mostly injurious, and include the Wire-worms and Buprestid Wood-borers. (Fig. 43.

4. *Leaf-horn* beetles knobbed antennæ made up of many leaf-like parts. (Fig. 44). Most of these are injurious, and include the Rose-beetles, June bugs, and Stag-beetles.

5. *Plant-Eater* beetles with bead-like antennæ. (Fig. 45). All of these are injurious, and include the potato-beetle (Fig. 46), Flea-beetle, and Pea-weevil.

Among the *Snout* beetles (Fig. 47), are Plum-curculio, Grain-weevils, and Bark-beetles. Most are injurious.

The *Lepidoptera* are divided into the Moths, Butterflies, and Skippers, (Fig. 48). Their larvæ are caterpillars, and some are among our most in-

jurious forms. Such are the Tent Caterpillar, Army-worm, Cutworm, Peach-tree Borer, Cabbage-worm, Codling worm, Canker Worm, and Mediterranean Flour Moth.

The *Diptera* are two-winged, and include such insects as the Hessian Fly, Wheat Midge (Fig. 49), Mosquitoes, Craneflies, Robber-flies, Bot-flies, House-

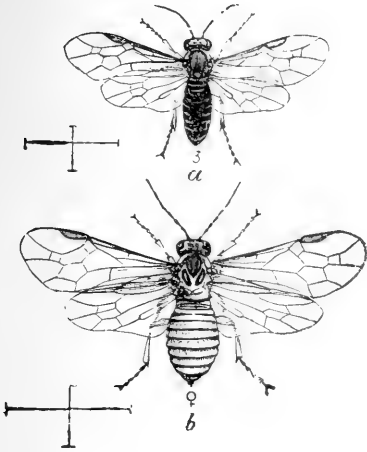


Fig. 40. Saw-flies: *a.* male; *b.* female (Hymenoptera)



Fig. 41. Tiger-Beetle.



Fig. 42. Lady-bird beetle.



Fig. 43. Saw-horn beetle (*Buprestis*).

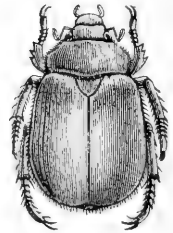


Fig. 44. Leaf-horn beetle.

flies, Tachina flies, Syrphus flies (Fig. 50) and cheese flies. The Tachina and Syrphus flies are very beneficial.

The *Hemiptera* or Bugs are divided into the *True-bugs* (Fig. 51), the *Leaf-hoppers* and *Plant lice* (Fig. 52) and *Lice*. Nearly all are injurious, and frequently do much injury. They suck the juices from plants.

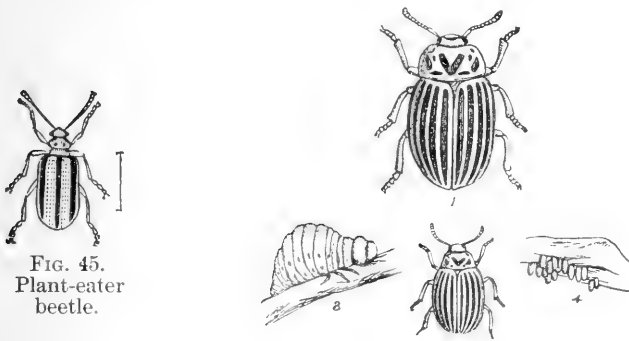


Fig. 46. Colorado Potato-beetle.

The *Orthoptera* are often divided into the *Jumpers*, the *Walkers*, the *Graspers*, and the *Runners*. The first includes the Grasshoppers, Locusts, Crickets; and the last the Cockroaches.

The *Neuroptera* comprise the Ant-lions, Lace-wings (Fig. 53), Dragon flies (Fig. 54),



FIG. 48. Skipper butterfly.

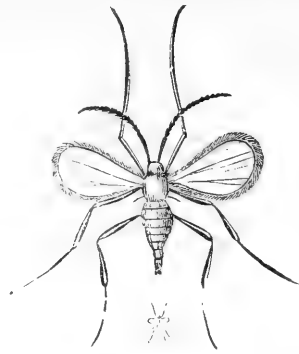


FIG. 49. Wheat-midge.



FIG. 50. Syrphus fly.

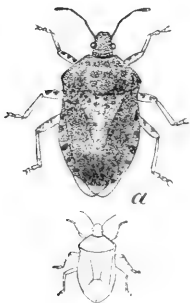


FIG. 51. True-bugs.

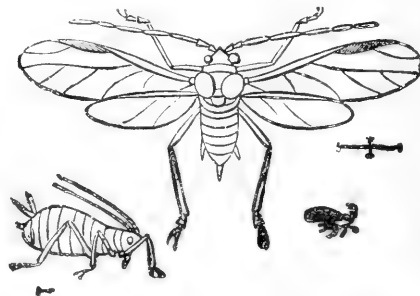


FIG. 52. Plant-lice (Aphis.)



FIG. 53. Lace-winged fly and its eggs on stalks.

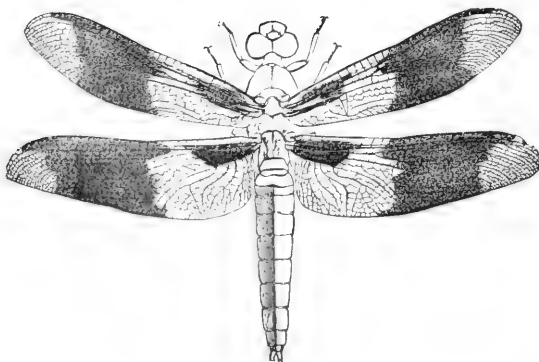


FIG. 54. Dragon-fly.

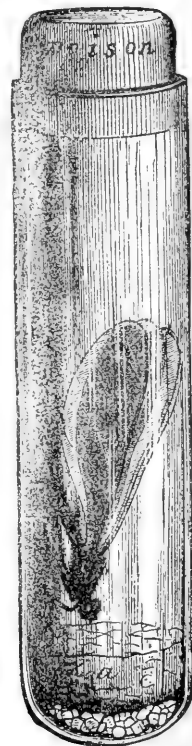


FIG. 55. Cyanide bottle.

COLLECTION OF INSECTS. The best way to become familiar with the different insects is to make a general collection. This is but a means to an end, for a real knowledge of insect life can only be acquired by observation in the

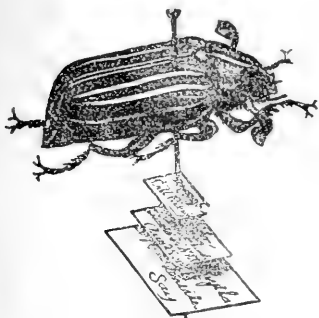


FIG. 56. How to pin and label a beetle.

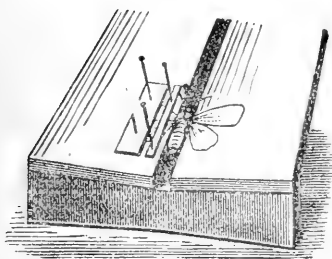


FIG. 57. Spreading-board.

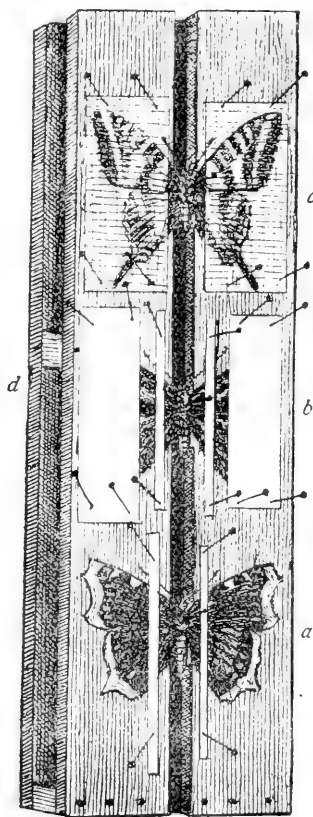


FIG. 58. Spreading-board.

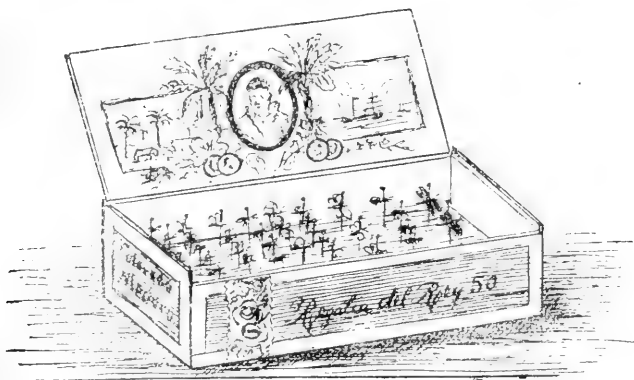


FIG. 59. Storage box for specimens.

fields. The insects should be watched during all their stages of growth, their food plants, and their habits noted.

The outfit for collecting is neither expensive, nor hard to prepare. It consists of (1) An *insect net* for catching the insects, made by sowing a bag of cheese-cloth to a stout ring, one foot in diameter, which is fastened to a broom handle; (2) A *cyanide bottle* (Fig. 55), for killing the insects, prepared by pouring some soft plaster-paris over a few lumps of potassium cyanide in a wide-mouthed bottle. When the plaster has set and the bottle corked, the whole is ready for use; (3) *pins* (Fig. 56) to mount the specimens; (4) Spreading-board for butterflies and moths (Figs. 57 and 58); (5) a *cigar-box*, lined with cork, or corrugated paper of the druggist's to hold the specimens. (Fig. 59).

When one considers the large number of injurious insects which attack the various crops, it is not surprising that the yearly losses amount to many millions of dollars. Of recent years, the Hessian Fly, the Pea-Weevil, the Clover-Seed Midge, the Wheat Midge, The San José Scale, the Codling Moth, and the Tent Caterpillar have been very active; and, in some sections of Ontario, many crops were complete failures by reason of their ravages.

Careful estimates of the probable losses have been made at different times by competent scientific men, and the conclusion was that the annual loss was about one-tenth the total agricultural product of the United States and Canada.

THE PEAR-TREE PSYLLA AND HOW TO DEAL WITH IT.

BY GEORGE E. FISHER, BURLINGTON.

Several instances of disastrous and even fatal effects to valuable pear orchards from being attacked by the Psylla have come under my observation, as well as entirely satisfactory results from treating the trees.

The life-history and habits of injurious insects must be accurately determined before we can know just how to deal with them. A knowledge of the habits of such insects will often enable the farmer to so manage his land and crops that the insects are placed under unfavorable and even destructive conditions.

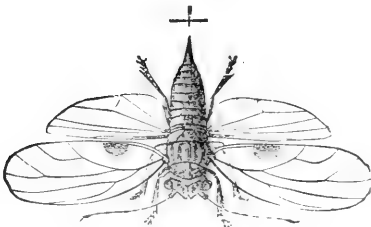


Fig 60.

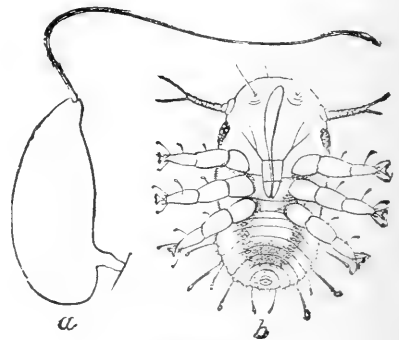


Fig. 61.

The Psylla winters in the full-grown or perfect state, a minute brick-red fly, about one-eighth of an inch in length. From the broad head the body tapers to a point at the caudal extremity. There are two pairs of large transparent wings, which when closed cover the body. The thighs are abnormally developed, which enables it to jump a long way; hence the name "Pear-tree Flea-louse." In form this insect is the counterpart of the Dog-

day Harvest fly (*Cicada*) in miniature (Fig. 60). During the winter it secures shelter in the crevices of the bark on the trunks and large limbs of the trees, in nearby rubbish, or wherever it can find protection; hence the advantage of clean culture, in which case it will be confined to the trees. The small lemon-coloured eggs are laid about the middle of April, and hatch about the middle of May, according to weather conditions (Figure 61). There are probably four broods in a season. When the nymphs appear, if there be no foliage, they make their way into the opening buds. They secrete large quantities of honey dew, which frequently drips from the leaves, and gets over the whole of the tree and fruit, in which a black fungus develops.

There is difficulty in treating the *Psylla* during the summer. Except immediately following a heavy rain, the nymphs are usually so completely enveloped with honey dew that spray will not reach them, and the mature insects are so active that when spray strikes a tree they instantly fly away, and do not return until spraying is discontinued.

An ounce of crude petroleum in the proportion of 1 in 16 (1 gal. of petroleum in 16 gals. of emulsion), has in my experience proved the most satisfactory in case a treatment must be given in summer, but I would depend upon a very thorough application of lime and sulphur (lime 30 lbs., sulphur 20 lbs., in 40 gals. of wash, cooked two hours), made in March, to wipe out the pest. At this season there are no eggs. The overwintered adults are very sluggish, not at all like those of the summer broods, and these alone are present. If the wash be driven well into all of the cracks of the bark the destruction of the insects will be complete.

Lime alone will destroy *Psylla* perhaps as completely as with sulphur added, and will go a long way in cleaning off the black fungus, but lime alone will not destroy scale insects, and these are invariably present. Whether it be lime, or lime and sulphur that is used, the wash must be liberally applied, for it will not diffuse, but remains where it strikes the tree, and if the *Psylla* is to be killed it must be hit.

OBITUARY.

THE LATE JOHN ALSTON MOFFAT.

Through the kindness of Mr. G. L. Johnston, President of the Hamilton Scientific Association, we are enabled to present our readers with an excellent portrait of our late friend and colleague, Mr. J. Alston Moffat, who died at the Victoria Hospital in London, on the 26th of February, 1904. For fourteen years he had been the Librarian and Curator of the Entomological Society of Ontario, and endeared himself to all with whom he came in contact by his kindness and courtesy. It was always a pleasure to him to identify specimens, and to exhibit the beautiful objects in the Society's cabinets to anyone interested in natural history. He was a frequent contributor to the *Canadian Entomologist*, and to these Annual Reports. In the last volume (the 34th Annual Report, 1903, page 103) will be found an interesting account of his "Recollections of the Past," which contains reminiscences of his life and relates how he came to study entomology.

"Mr. Moffat was born on the family estate of Milton, about three miles from the city of Glasgow, Scotland, in the year 1825. Through business misfortune his father lost his wealth and removed to Glasgow, where he en-

gaged in mercantile pursuits. Not liking city life, he came to Canada by himself, proposing to find a home for his family in this new country. Soon after he left Scotland, his wife—Mr. Moffat's mother—died; he at once sent for his family, who landed at New York on July 1, 1836, and settled in the Township of Nassagaweya; there the father married again. This homestead is still in the possession of the only son of that marriage. After a time John's eldest brother took up land and settled in the township of Binbrook, and there John Alston made his home for some years.

"After a time he came to Hamilton and engaged in business as a merchant tailor, but being in indifferent health he was in the habit of taking long walks in the open country as a relaxation from business. It was during these walks that he formed those habits of observation of the insect life which he saw around him, that shaped all his future career. He found so much enjoyment in the capturing of insects and observing their life history, and became so absorbed in the science of Entomology, that in spite of much good natured ridicule from his friends, he gave up his city business altogether and 'going from bad to worse' as he expressed it, devoted his whole time to the study of insect life.

"He soon became well-known to all the entomologists of Canada, as well as to many in the United States, and was a most industrious collector of specimens. His habits of observation were exact, and as a result he found a new species of moth which was named *Scopelosoma Moffatiana* in his honour by Mr. Grote, an Entomological expert. It is figured in Dr. Hollands's Moth Book," plate xxvi. fig. 33, and is called by him 'Moffat's Sallow.'

"He was a nephew of the well-known Dr. Moffat, who was surgeon to Wellington, during the conflict with Napoleon, and also of Bailie Alston, a well-known philanthropist of Glasgow. Mr. Moffat was a man of quiet and retiring disposition, and at his death in his eightieth year, was as straight of body, and clear of mind as in his youth. He passed away honoured and respected by all who knew him as a friend, and this society and the one with which he was most intimately connected are all the poorer from his loss."

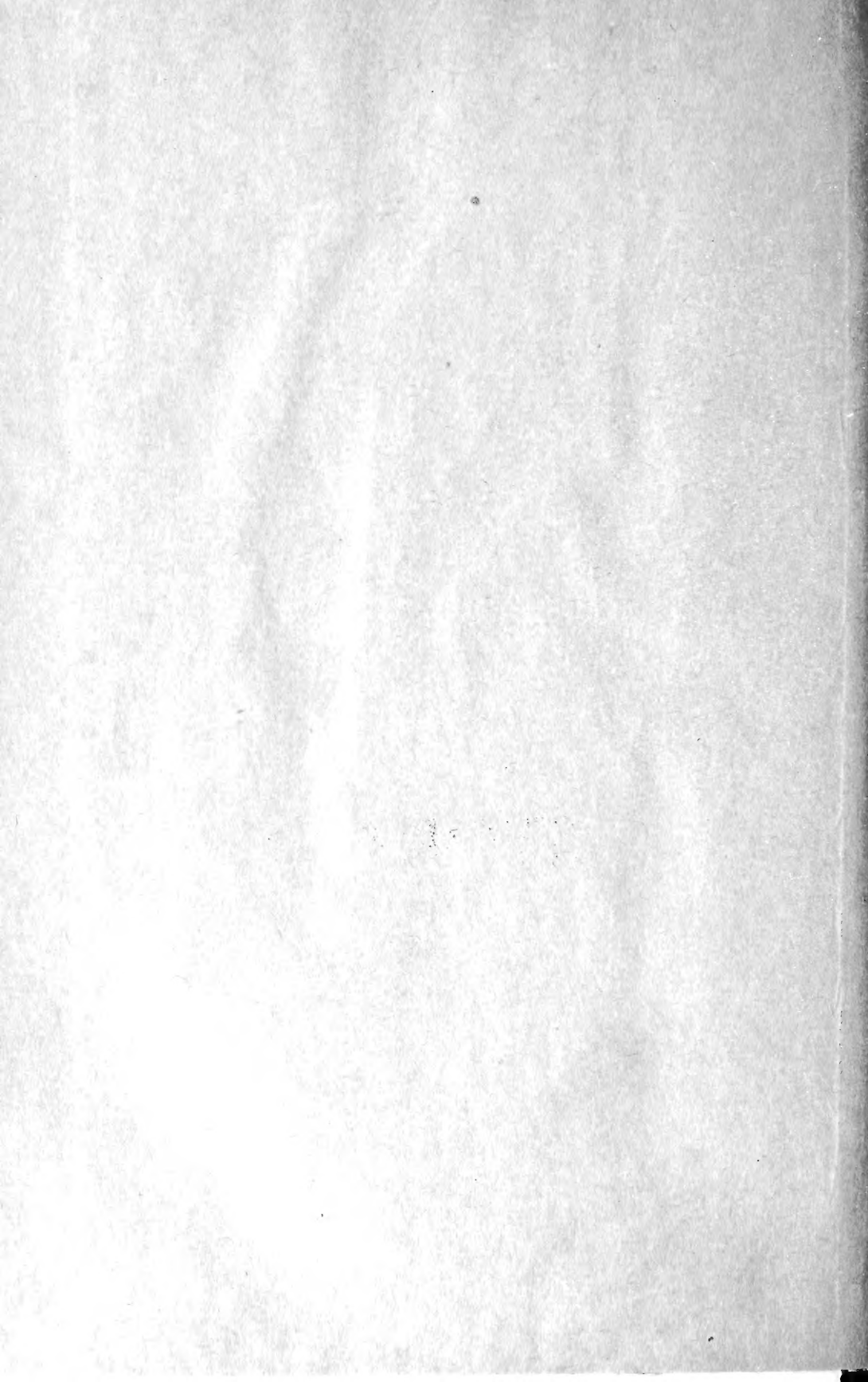
Mr. Moffat's first contribution to these Reports was made in 1880, when he furnished a short account of an assembly of Archippus butterflies that he had observed. This was followed by "Collecting Notes" in each of the next three volumes. In 1884 and 1886 two papers appeared from his pen on the habits of Ant-lions. From this time on, he became a regular contributor; the following are the more important of his papers: "Species, Varieties and Check-lists" (1887) and "Some thoughts on the Determination of Species" (1889), "Origin and perpetuation of Arctic forms" (1890); "The power of Insects to resist cold" (1892); "A microscopical examination of an unexpanded wing of *Callosamia promethea*" (1891); this became a special subject of interest to him and led to papers "Remarks on the structure of the undeveloped wings of the Saturniidae," "Growth of the Wings of a Luna Moth" and "The Wing-structure of a Butterfly" (1894-1899); "Mosquitoes" (1893); "A reappearance of *Pieris protodice*" (1894); "Variation with special reference to Insects" (1895); "Value of Systematic Entomological Observations" and "Protective resemblance" (1897); "Random Recollections" and "A bit of History" (1898); Observations on the Migration and Hibernation of the Archippus Butterfly (1900-1901); "A talk about Entomology" (1892), and his "Reminiscences" in 1903 already referred to. He also contributed "Notes on the Season" every year from 1895 to 1902. Though he never had any educational advantages, he was an interesting writer, and often displayed much thought and accurate powers of observation.

C. J. S. B.

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